



TEST REPORT

No. 2012TAR147

for

Sony Ericsson Mobile Communications AB

**GSM 850/900/1800/1900 quad bands and UMTS FDD 1/2/5 mobile
phone**

Type: AAD-3880131-BV

FCC ID: PY7A3880131

IC No.: 4170B-A3880131

with

Hardware Version: 6.0.B.1.113

Software Version: A

Issued Date: Mar. 12th, 2012

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of TMC Beijing.

Test Laboratory:

DAR accreditation (DIN EN ISO/IEC 17025): No. DGA-PL-114/01-02

FCC 2.948 Listed: No.733176

IC O.A.T.S listed: No.6629A-1

TMC Beijing, Telecommunication Metrology Center of Ministry of Industry and Information Technology

No. 52, Huayuan Bei Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0) 10-62304633-2678, Fax:+86(0)10-62304633-2504 Email:welcome@emcite.com. www.emcite.com

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1. Test Laboratory

1.1. Testing Location

Company Name: TMC Beijing, Telecommunication Metrology Center of MIIT
Address: No 52, Huayuan beilu, Haidian District, Beijing, P.R.China
Postal Code: 100191
Telephone: +86-10-62304633-2678
Fax: +86-10-62304633-2504

1.2. Testing Environment

Normal Temperature: 15-35°C
Relative Humidity: 20-75%
Air pressure 980 - 1040 hPa

The climatic requirements above are general exclude the special requirements for dedicated test environments listed in section 5 and some specific test cases in other parts of this report.

1.3. Project data

Receipt of Sample Feb. 21st, 2012
Testing Start Date: Feb. 22nd, 2012
Testing End Date: Mar. 09th, 2012

1.4. Signature



Qu Pengfei

(Prepared this test report)



Sun Xiangqian

(Reviewed this test report)



Song Chongwen

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name: Sony Ericsson Mobile Communications(China) Co., Ltd.
Address /Post: Sony Ericsson Building, No.16, Guangshun South Street, Chaoyang
District, Beijing
City: Beijing
Postal Code: 100102
Country: China
Contact Person: Ma, Gang
Telephone: +86-10-58656312
Fax: +86-10-58659049

2.2. Manufacturer Information

Company Name: Sony Ericsson Mobile Communications AB
Address /Post: Nya Vattentornet, 22188 Lund, Sweden
City: Lund
Postal Code: 22188
Country: Sweden
Contact Person: Nordlof, Anders
Telephone: +46-10-802 3919
Fax: +46-10-800 2441

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

| | |
|-------------------------|--|
| Description | GSM 850/900/1800/1900, GPRS, EDGE, WCDMA FDD Band 1/2/5, BT EDR2.0, WLAN (802.11 b/g/n), FM, GPS receiver mobile phone |
| Type | AAD-3880131-BV |
| FCC ID | PY7A3880131 |
| IC No | 4170B-A3880131 |
| Frequency range | GSM 850: 824.2 MHz - 848.8 MHz PCS 1900: 1850.2 MHz -1909.8 MHz WCDMA 850:824 MHz - 849 MHz WCDMA 1900:1850 MHz -1910 MHz |
| Antenna | Internal |
| Power supply | Battery or charger (travel adaptor / vehicle adaptor) |
| Output power | 31.22 dBm maximum ERP measured for GSM850 30.44 dBm maximum EIRP measured for PCS1900 26.29 dBm maximum ERP measured for WCDMA 850 27.19 dBm maximum EIRP measured for WCDMA 1900 |
| Extreme vol. Limits | 3.5VDC to 4.1VDC (nominal: 3.7VDC) |
| Extreme temp. Tolerance | -30°C to +50°C |

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of Telecommunication Metrology Center of MIIT of People's Republic of China.

3.2. Internal Identification of EUT used during the test

| EUT ID* | SN | IMEI | HW Version | SW Version |
|----------------|------------|-----------------|-------------------|-------------------|
| N23 | BX902T0A0Q | 004402144893157 | A | 6.0.B.1.113 |
| N24 | BX902T0A0Y | 004402144893173 | A | 6.0.B.1.113 |

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

| AE ID* | Description | SN | Revision |
|---------------|--------------------|------------------|-----------------|
| AE1 | Battery | 000064PTSIOH | 1C |
| AE2 | Battery | 000558PTSIOH | 1C |
| #20183 | Travel Charger | 8511W 12 S 10380 | 1 |
| #20258 | USB Cable | 105012D8042277E | 1 |

AE1, AE2

Type CBA-0002030
 Manufacturer Sony Ericsson
 Minimal Capacitance 1290mAh
 Nominal Voltage 3.7V

#20183

Type CAA-0002016-BV
 Manufacturer Salcomp
 Length of cable 99cm (length of USB cable)

#20258

Commercial Name EC450
 Manufacturer Sony Ericsson
 Length of cable 99cm

*AE ID: is used to identify the test sample in the lab internally.

3.4. General Description

The Equipment Under Test (EUT) is a model of GSM 850/900/1800/1900 quad bands and UMTS FDD 1/2/5 mobile phone with integrated antenna.

The EUT supports GSM 850/900/1800/1900MHz bands and WCDMA 850/1900/2100MHz bands. It also supports GPRS service with multi-slots class 33 and EGPRS service with multi-slots class 33 too. The HSDPA and HSUPA features are also supported.

It has MP3, Camera, FM radio, USB memory, GPS receiver, Bluetooth (EDR), WLAN (802.11 b/g/n) and Wi-Fi hotspot functions.

It consists of normal options: lithium battery and travel charger.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

3.5. EUT set-ups

| EUT Set-up No. | Combination of EUT and AE | Remarks |
|----------------|----------------------------------|---------------------------|
| Set. 7 | N23 + AE1/ AE2 + #20183 + #20258 | Tests with travel charger |
| Set. 8 | N23 + AE1/ AE2 | ERP/EIRP/RSE tests |
| Set. 9 | N24 + AE1/AE2 | Conducted RF tests |

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

| Reference | Title | Version |
|------------------|--|--------------------|
| FCC Part 24 | PERSONAL COMMUNICATIONS SERVICES | 10-1-10 Edition |
| FCC Part 22 | PUBLIC MOBILE SERVICES | 10-1-10 Edition |
| RSS-132 | Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz | Issue2 |
| RSS-133 | 2 GHz Personal Communications Services | Issue5 |
| ANSI/TIA-603-C | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards | 2004 |
| ANSI C63.4 | Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz | 2003 |

5. LABORATORY ENVIRONMENT

Semi-anechoic chamber (23 meters×17meters×10meters) did not exceed following limits along the EMC testing:

| | |
|-----------------------------------|---|
| Temperature | Min. = 15 °C, Max. = 30 °C |
| Relative humidity | Min. = 30 %, Max. = 60 % |
| Shielding effectiveness | > 110 dB |
| Electrical insulation | > 2 MΩ |
| Ground system resistance | < 0.5 Ω |
| Normalised site attenuation (NSA) | < ±3.2 dB, 10 m distance, from 30 to 1000 MHz |
| Uniformity of field strength | Between 0 and 6 dB, from 80 to 2000 MHz |

Control room did not exceed following limits along the EMC testing:

| | |
|--------------------------|----------------------------|
| Temperature | Min. = 15 °C, Max. = 35 °C |
| Relative humidity | Min. =20 %, Max. = 80 % |
| Shielding effectiveness | > 110 dB |
| Electrical insulation | > 2 MΩ |
| Ground system resistance | < 0.5 Ω |

Conducted chamber did not exceed following limits along the EMC testing:

| | |
|--------------------------|----------------------------|
| Temperature | Min. = 15 °C, Max. = 30 °C |
| Relative humidity | Min. = 35 %, Max. = 60 % |
| Shielding effectiveness | > 110 dB |
| Electrical insulation | > 2 MΩ |
| Ground system resistance | < 0.5 Ω |

Fully-anechoic chamber2 (8.6 meters×6.1 meters×3.85 meters) did not exceed following limits along the EMC testing:

| | |
|------------------------------|---|
| Temperature | Min. = 15 °C, Max. = 30 °C |
| Relative humidity | Min. = 35 %, Max. = 60 % |
| Shielding effectiveness | > 110 dB |
| Electrical insulation | > 2 MΩ |
| Ground system resistance | < 1 Ω |
| Uniformity of field strength | Between 0 and 6 dB, from 80 to 4000 MHz |

6. SUMMARY OF TEST RESULTS

6.1. Summary of test results

Abbreviations used in this clause:

| | |
|----|----------------|
| P | Pass |
| NA | Not applicable |
| F | Fail |

GSM 850

| Items | Test Name | Clause in FCC rules | Clause in IC rules | Section in this report | Verdict |
|-------|-----------------------------|---------------------|--------------------|------------------------|---------|
| 1 | Output Power | 22.913(a) | 4.4 | A.1 | P |
| 2 | Emission Limit | 22.917, 2.1051 | 4.5 | A.2 | P |
| 3 | Conducted Emission | 15.107/207 | / | A.3 | P |
| 4 | Frequency Stability | 22.235, 2.1055 | 4.3 | A.4 | P |
| 5 | Occupied Bandwidth | 2.1049(h)(i) | 4.2 | A.5 | P |
| 6 | Emission Bandwidth | 22.917(b) | 4.2 | A.6 | P |
| 7 | Band Edge Compliance | 22.917(b) | 4.5 | A.7 | P |
| 8 | Conducted Spurious Emission | 22.917, 2.1057 | 4.5 | A.8 | P |

PCS 1900

| Items | Test Name | Clause in FCC rules | Clause in IC rules | Section in this report | Verdict |
|-------|-----------------------------|---------------------|--------------------|------------------------|---------|
| 1 | Output Power | 24.232(b) | 6.4 | A.1 | P |
| 2 | Emission Limit | 24.238, 2.1051 | 6.5 | A.2 | P |
| 3 | Conducted Emission | 15.107/207 | / | A.3 | P |
| 4 | Frequency Stability | 24.235, 2.1055 | 6.3 | A.4 | P |
| 5 | Occupied Bandwidth | 2.1049(h)(i) | 6.2 | A.5 | P |
| 6 | Emission Bandwidth | 24.238(b) | 6.2 | A.6 | P |
| 7 | Band Edge Compliance | 24.238(b) | 6.5 | A.7 | P |
| 8 | Conducted Spurious Emission | 24.238, 2.1057 | 6.5 | A.8 | P |

Receiver Radiated Emission

| Items | Test Name | Clause in FCC rules | Clause in IC rules | Section in this report | Verdict |
|-------|-----------------------------|---------------------|--------------------|------------------------|---------|
| 1 | Receiver Radiated Emissions | 15.109 , 2.1053 | 4.6, 6.6 | A.9 | P |

6.2. Statements

The test cases listed in section 6.1 of this report for the EUT specified in section 3 were performed by TMC according to the standards or reference documents in section 4.1

The EUT met all applicable requirements of the standards or reference documents in section 4.1.

This report only deals with the GSM/GPRS/EGPRS functions among the features described in section 3.

7. Test Equipments Utilized

| NO. | Description | TYPE | SERIES NUMBER | MANUFACTURE | CAL DUE DATE |
|-----|--------------------------------------|-----------|---------------|--------------|--------------|
| 1 | Test Receiver | ESCI | 100344 | R&S | 2012-03-28 |
| 2 | Test Receiver | ESCI | 100766 | R&S | 2012-04-11 |
| 3 | Test Receiver | ESI40 | 831564/002 | R&S | 2013-02-12 |
| 4 | EMI Antenna | VULB 9163 | 302 | Schwarzbeck | 2014-02-10 |
| 5 | EMI Antenna | 3115 | 6914 | EMCO | 2012-12-16 |
| 6 | LISN | ESH2-Z5 | 829991/012 | R&S | 2012-04-17 |
| 7 | Universal Radio Communication Tester | CMU200 | 116455 | R&S | 2012-05-21 |
| 8 | Universal Radio Communication Tester | E5515C | MY48361083 | Agilent | 2012-03-16 |
| 9 | Spectrum Analyzer | E4440A | 00112642 | Agilent | 2013-03-04 |
| 10 | EMI Antenna | 9117 | 177 | Schwarzbeck | 2012-05-31 |
| 11 | EMI Antenna | VULB 9163 | 482 | Schwarzbeck | 2014-02-17 |
| 12 | EMI Antenna | 3117 | 00119024 | ETS-Lindgren | 2014-02-02 |
| 13 | EMI Antenna | 3117 | 00058889 | ETS-Lindgren | 2014-02-02 |
| 14 | Signal Generator | N5183A | MY49060052 | Agilent | 2013-01-19 |
| 15 | Climatic chamber | PL-2G | 343074 | ESPEC | 2012-05-12 |

ANNEX A: MEASUREMENT RESULTS

A.1 OUTPUT POWER

Reference

FCC: CFR Part 22.913(a), 24.232(b)

IC: RSS 132, Issue 2, Section 4.4. RSS 133, Issue 5, Section 6.4

A.1.1 Summary

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMU-200) to ensure max power transmission and proper modulation.

This result contains peak output power and EIRP measurements for the EUT.

In all cases, output power is within the specified limits.

A.1.2 Conducted

A.1.2.1 Method of Measurements

The EUT was set up for the max output power with pseudo random data modulation.

The power was measured with spectrum analyzer's peak detector.

These measurements were done at 3 frequencies (bottom, middle and top of operational frequency range) for each band: 1850.2 MHz, 1880.0MHz and 1909.8MHz for PCS1900 band; 824.4MHz, 836.6MHz and 848.8MHz for GSM850 band.

GSM850

Limit

| | Power step | Nominal Peak output power (dBm) | Tolerance (dB) | Target (dBm) |
|-------------|------------|---------------------------------|----------------|--------------|
| GSM | 5 | 33dBm(2W) | ± 2 | 33±1 |
| GPRS | 3 | 33dBm(2W) | ± 2 | 33±1 |
| EGPRS(GMSK) | 6 | 33dBm(2W) | ± 2 | 33±1 |

Measurement result

GSM (GMSK)

| Frequency(MHz) | Power Step | Peak output power(dBm) |
|----------------|------------|------------------------|
| 824.2 | 5 | 32.34 |
| 836.6 | 5 | 32.38 |
| 848.8 | 5 | 32.40 |

GPRS (GMSK, Time Slot 2)

| Frequency(MHz) | Power Step | Peak output power(dBm) |
|----------------|------------|------------------------|
| 824.2 | 3 | 32.30 |
| 836.6 | 3 | 32.36 |
| 848.8 | 3 | 32.40 |

EGPRS (8PSK, Time Slot 2)

| Frequency(MHz) | Power Step | Peak output power(dBm) |
|----------------|------------|------------------------|
| 824.2 | 6 | 27.30 |
| 836.6 | 6 | 27.42 |
| 848.8 | 6 | 27.47 |

Note: Expanded measurement uncertainty for GSM850 is $U = 0.52\text{dB}$, $k=2$.

PCS1900

Limit

| | Power step | Nominal Peak output power (dBm) | Tolerance (dB) | Target (dBm) |
|-------|------------|---------------------------------|----------------|--------------|
| GSM | 0 | 30dBm(1W) | ± 2 | 30 \pm 1 |
| GPRS | 3 | 30dBm(1W) | ± 2 | 30 \pm 1 |
| EGPRS | 5 | 30dBm(1W) | ± 2 | 30 \pm 1 |

Measurement result

GSM (GMSK)

| Frequency(MHz) | Power Step | Peak output power(dBm) |
|----------------|------------|------------------------|
| 1850.2 | 0 | 29.56 |
| 1880.0 | 0 | 29.65 |
| 1909.8 | 0 | 29.70 |

GPRS (GMSK, Time Slot 2)

| Frequency(MHz) | Power Step | Peak output power(dBm) |
|----------------|------------|------------------------|
| 1850.2 | 3 | 29.57 |
| 1880.0 | 3 | 29.67 |
| 1909.8 | 3 | 29.29 |

EGPRS (8PSK, Time Slot 2)

| Frequency(MHz) | Power Step | Peak output power(dBm) |
|----------------|------------|------------------------|
| 1850.2 | 5 | 27.08 |
| 1880.0 | 5 | 27.10 |
| 1909.8 | 5 | 27.07 |

Note: Expanded measurement uncertainty for PCS1900 is $U = 0.83\text{dB}$, $k=2$.

A.1.3 Radiated

A.1.3.1 Description

This is the test for the maximum radiated power from the EUT.

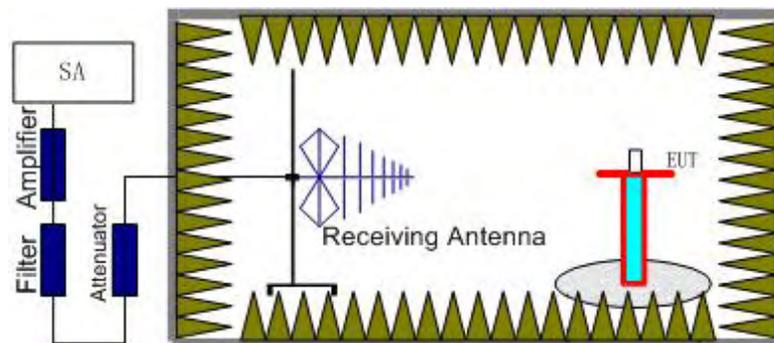
Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Rule Part 22.913(a) specifies "Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

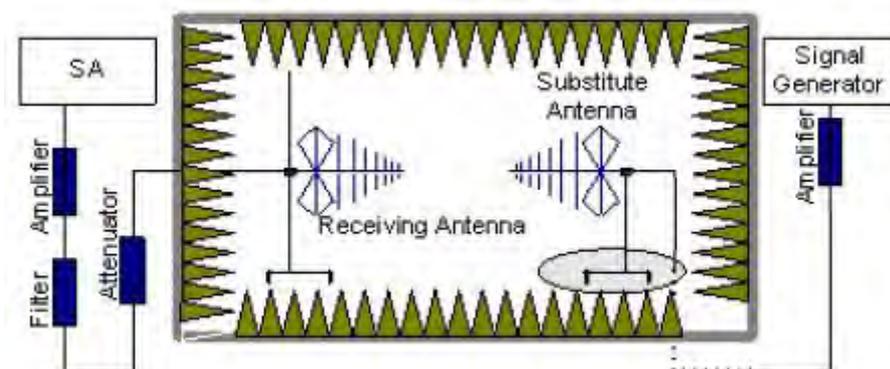
A.1.3.2 Method of Measurement

The measurements procedures in TIA-603C-2004 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, a substitution antenna for the frequency band of interest is placed at the

reference point of the chamber. An RF signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. An amplifier should be connected to the Signal Source output port. And the cable should be connected between the amplifier and the substitution antenna.
The cable loss (P_{cl}), the substitution antenna Gain (G_a) and the amplifier Gain (P_{Ag}) should be recorded after test.
The measurement results are obtained as described below:
Power (EIRP) = $P_{Mea} - P_{Ag} - P_{cl} - G_a$
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP - 2.15.

For test layout photo, please refer to Pic.1 in Annex B.

GSM 850- ERP 22.913(a)

Limits

| | Power Step | Burst Peak ERP (dBm) |
|-------|------------|----------------------|
| GSM | 5 | ≤38.45dBm (7W) |
| GPRS | 3 | ≤38.45dBm (7W) |
| EGPRS | 6 | ≤38.45dBm (7W) |

Measurement result

GSM (GMSK)

| Frequency (MHz) | P_{Mea} (dBm) | P_{cl} (dB) | P_{Ag} (dB) | G_a (dBi) | Correction (dB) | Peak ERP(dBm) | Polarization |
|-----------------|-----------------|---------------|---------------|-------------|-----------------|---------------|--------------|
| 824.2 | -18.27 | 2.26 | -53 | 0.84 | 2.15 | 29.48 | Horizontal |
| 836.6 | -16.47 | 2.26 | -53 | 0.90 | 2.15 | 31.22 | Horizontal |
| 848.8 | -17.12 | 2.28 | -53 | 0.95 | 2.15 | 30.50 | Vertical |

GPRS (GMSK)

| Frequency (MHz) | P_{Mea} (dBm) | P_{cl} (dB) | P_{Ag} (dB) | G_a (dBi) | Correction (dB) | Peak ERP(dBm) | Polarization |
|-----------------|-----------------|---------------|---------------|-------------|-----------------|---------------|--------------|
| 824.2 | -18.39 | 2.26 | -53 | 0.84 | 2.15 | 29.36 | Horizontal |
| 836.6 | -16.71 | 2.26 | -53 | 0.9 | 2.15 | 30.98 | Horizontal |
| 848.8 | -17.5 | 2.28 | -53 | 0.95 | 2.15 | 30.12 | Vertical |

EGPRS (8PSK)

| Frequency (MHz) | P_{Mea} (dBm) | P_{cl} (dB) | P_{Ag} (dB) | G_a (dBi) | Correction (dB) | Peak ERP(dBm) | Polarization |
|-----------------|-----------------|---------------|---------------|-------------|-----------------|---------------|--------------|
| 824.2 | -20.33 | 2.26 | -53 | 0.84 | 2.15 | 27.42 | Horizontal |
| 836.6 | -18.86 | 2.26 | -53 | 0.90 | 2.15 | 28.83 | Horizontal |
| 848.8 | -19.32 | 2.28 | -53 | 0.95 | 2.15 | 28.30 | Horizontal |

Sample calculation: GSM, 836.6 MHz

$$\text{Peak ERP(dBm)} = P_{\text{Mea}}(-16.47\text{dBm}) - G_a(0.90\text{dBi}) - P_{\text{Ag}}(-53.00\text{dB}) - P_{\text{cl}}(2.26\text{dB}) - 2.15\text{dB} \\ = 31.22 \text{ dBm}$$

ANALYZER SETTINGS: RBW = VBW = 3MHz

Note: Expanded measurement uncertainty for GSM850 is $U = 0.96\text{dB}$, $k=2$.

PCS1900- EIRP 24.232(b)

Limits

| | Power Step | Burst Peak EIRP (dBm) |
|-------|------------|-----------------------|
| GSM | 0 | ≤33dBm (2W) |
| GPRS | 3 | ≤33dBm (2W) |
| EGPRS | 5 | ≤33dBm (2W) |

Measurement result

GSM (GMSK)

| Frequency (MHz) | P_{Mea} (dBm) | P_{cl} (dB) | P_{Ag} (dB) | G_a (dBi) | Peak EIRP(dBm) | Polarization |
|-----------------|------------------------|----------------------|----------------------|-------------|----------------|--------------|
| 1850.2 | -18.35 | 5.95 | -50 | -4.56 | 30.26 | Horizontal |
| 1880.0 | -17.38 | 7.05 | -50 | -4.43 | 30.00 | Vertical |
| 1909.8 | -14.74 | 9.12 | -50 | -4.30 | 30.44 | Vertical |

GPRS (GMSK)

| Frequency (MHz) | P_{Mea} (dBm) | P_{cl} (dB) | P_{Ag} (dB) | G_a (dBi) | Peak EIRP(dBm) | Polarization |
|-----------------|------------------------|----------------------|----------------------|-------------|----------------|--------------|
| 1850.2 | -18.76 | 5.95 | -50 | -4.56 | 29.85 | Horizontal |
| 1880.0 | -18.04 | 7.05 | -50 | -4.43 | 29.34 | Horizontal |
| 1909.8 | -15.97 | 9.12 | -50 | -4.30 | 29.21 | Horizontal |

EGPRS (8PSK)

| Frequency (MHz) | P_{Mea} (dBm) | P_{cl} (dB) | P_{Ag} (dB) | G_a (dBi) | Peak EIRP(dBm) | Polarization |
|-----------------|------------------------|----------------------|----------------------|-------------|----------------|--------------|
| 1850.2 | -19.95 | 5.95 | -50 | -4.56 | 28.66 | Horizontal |
| 1880.0 | -19.81 | 7.05 | -50 | -4.43 | 27.57 | Horizontal |
| 1909.8 | -16.61 | 9.12 | -50 | -4.30 | 28.57 | Vertical |

Sample calculation: GSM, 1909.8 MHz

$$\text{Peak EIRP(dBm)} = P_{\text{Mea}}(-14.74\text{dBm}) - G_a(-4.30\text{dBi}) - P_{\text{Ag}}(-50.00\text{dB}) - P_{\text{cl}}(9.12\text{dB}) = 30.44 \text{ dBm}$$

ANALYZER SETTINGS: RBW = VBW = 3MHz

Note: Expanded measurement uncertainty for PCS1900 is $U = 1.07\text{dB}$, $k=2$.

A.2 EMISSION LIMIT

Reference

FCC: CFR 2.1051, Part 22.917(a), 24.238(b)

IC: RSS 132, Issue 2, Section 4.4. RSS 133, Issue 5, Section 6.2

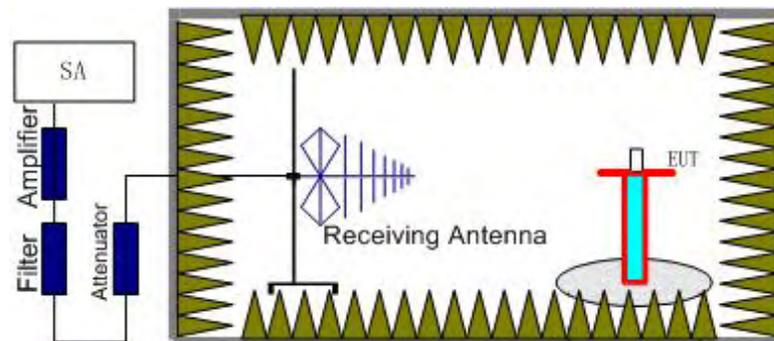
A.2.1 Measurement Method

The measurements procedures in TIA-603C-2004 are used. This measurement is carried out in fully-anechoic chamber 3.

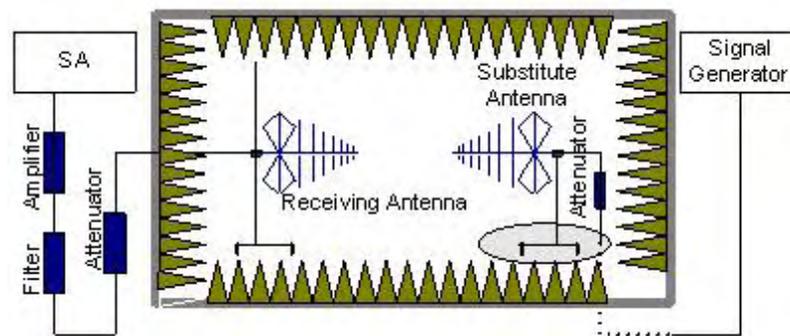
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set 1MHz as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the PCS1900 band, GSM850 band.

The procedure of radiated spurious emissions is as follows:

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss (P_{pl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test.

An amplifier should be connected in for the test.

The Path loss (P_{pl}) is the summation of the cable loss and the gain of the amplifier.

The measurement results are obtained as described below:

$$\text{Power (EIRP)} = P_{Mea} + P_{pl} + G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dB}$.

A.2.2 Measurement Limit

Part 24.238 specifies that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS band (1850.2 MHz, 1880 MHz and 1909.8 MHz), GSM850 band (824.2MHz, 836.6MHz and 848.8MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a

carrier in one block of the GSM850 or PCS1900 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

GSM Mode Channel 128/824.2MHz

| Frequency (MHz) | P _{Mea} (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP(dBm) | Limit (dBm) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|---------------|-------------|--------------|
| 3608.65 | -69.11 | 5.32 | -8.03 | 2.15 | -68.55 | -13.00 | Vertical |
| 4416.08 | -70.71 | 6.15 | -8.75 | 2.15 | -70.26 | -13.00 | Vertical |
| 5128.34 | -69.14 | 6.95 | -9.78 | 2.15 | -68.46 | -13.00 | Horizontal |
| 6196.01 | -66.27 | 10.40 | -10.36 | 2.15 | -68.46 | -13.00 | Horizontal |
| 8241.40 | -55.27 | 7.64 | -12.04 | 2.15 | -53.02 | -13.00 | Horizontal |
| 9037.69 | -65.57 | 8.31 | -12.60 | 2.15 | -63.43 | -13.00 | Vertical |

GSM Mode Channel 190/836.6MHz

| Frequency (MHz) | P _{Mea} (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP(dBm) | Limit (dBm) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|---------------|-------------|--------------|
| 3457.07 | -68.51 | 5.49 | -7.8 | 2.15 | -68.35 | -13 | Horizontal |
| 4349.24 | -68.57 | 6.32 | -8.71 | 2.15 | -68.33 | -13 | Vertical |
| 5293.61 | -68.6 | 7.53 | -9.88 | 2.15 | -68.40 | -13 | Vertical |
| 6604.18 | -66.43 | 7.51 | -10.7 | 2.15 | -65.39 | -13 | Horizontal |
| 8365.39 | -57.79 | 7.67 | -12.12 | 2.15 | -55.49 | -13 | Horizontal |
| 9832.25 | -68.06 | 8.23 | -12.47 | 2.15 | -65.97 | -13 | Horizontal |

GSM Mode Channel 251/848.8MHz

| Frequency (MHz) | P _{Mea} (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP(dBm) | Limit (dBm) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|---------------|-------------|--------------|
| 3328.72 | -69.10 | 5.23 | -7.49 | 2.15 | -68.99 | -13 | Horizontal |
| 3943.61 | -70.54 | 5.87 | -8.43 | 2.15 | -70.13 | -13 | Horizontal |
| 5137.68 | -68.67 | 7.03 | -9.78 | 2.15 | -68.07 | -13 | Vertical |
| 5909.16 | -68.69 | 13.04 | -10.16 | 2.15 | -73.72 | -13 | Vertical |
| 7180.50 | -68.18 | 8.72 | -11.21 | 2.15 | -67.84 | -13 | Vertical |
| 8756.36 | -66.00 | 8.18 | -12.41 | 2.15 | -63.92 | -13 | Horizontal |

GSM Mode Channel 512/1850.2MHz

| Frequency (MHz) | P _{Mea} (dBm) | P _{pl} (dB) | G _a (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarity |
|-----------------|------------------------|----------------------|----------------------|-----------------|-------------|------------|
| 3887.16 | -67.76 | 5.68 | -8.36 | -65.08 | -13 | Horizontal |
| 5550.92 | -65.1 | 8.71 | -10.02 | -63.79 | -13 | Vertical |
| 10129.07 | -65.98 | 8.48 | -12.43 | -62.03 | -13 | Vertical |
| 12165.2 | -66.08 | 9.63 | -12.57 | -63.14 | -13 | Horizontal |
| 13813.69 | -63.91 | 11.45 | -13.93 | -61.43 | -13 | Vertical |
| 16268.04 | -60.79 | 11.43 | -12.68 | -59.54 | -13 | Horizontal |

GSM Mode Channel 661/1880.0MHz

| Frequency (MHz) | P _{Mea} (dBm) | P _{pl} (dB) | G _a (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarity |
|-----------------|------------------------|----------------------|----------------------|-----------------|-------------|------------|
| 4027.75 | -70.85 | 5.95 | -8.52 | -68.28 | -13 | Vertical |
| 5210.07 | -69.29 | 7.6 | -9.83 | -67.06 | -13 | Vertical |
| 7355.96 | -67.8 | 8.99 | -11.31 | -65.48 | -13 | Horizontal |
| 8646.8 | -67.88 | 7.74 | -12.32 | -63.30 | -13 | Horizontal |
| 10215.29 | -67.71 | 8.59 | -12.44 | -63.86 | -13 | Horizontal |
| 12648.1 | -62.18 | 9.93 | -12.88 | -59.23 | -13 | Horizontal |

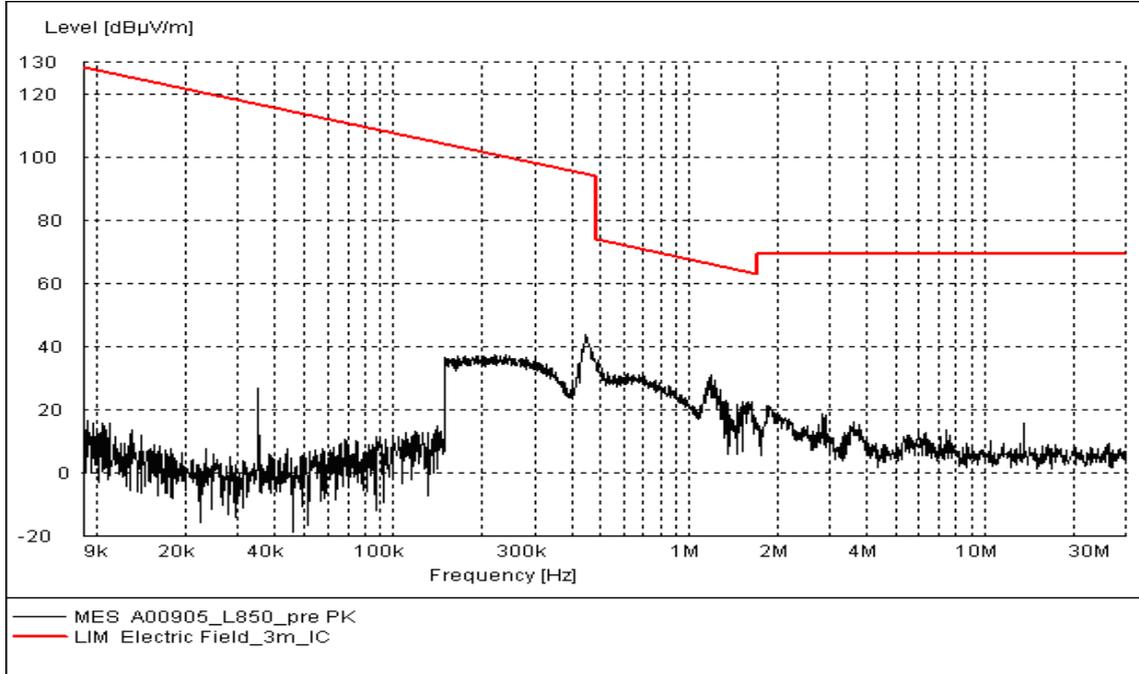
GSM Mode Channel 810/1909.8MHz

| Frequency (MHz) | P _{Mea} (dBm) | P _{pl} (dB) | G _a (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarity |
|-----------------|------------------------|----------------------|----------------------|-----------------|-------------|------------|
| 3820.05 | -61.41 | 5.55 | -8.28 | -58.68 | -13 | Vertical |
| 5729.19 | -57.68 | 10.05 | -10.09 | -57.64 | -13 | Vertical |
| 8643.83 | -67.01 | 7.76 | -12.32 | -62.45 | -13 | Vertical |
| 10251.28 | -66.81 | 8.6 | -12.45 | -62.96 | -13 | Horizontal |
| 13170.78 | -62.37 | 10.27 | -13.47 | -59.17 | -13 | Horizontal |
| 15025.42 | -61.53 | 11.31 | -13.49 | -59.35 | -13 | Vertical |

Note: Expanded measurement uncertainty for this test item is $U = 4.21\text{dB}$, $k=2$.

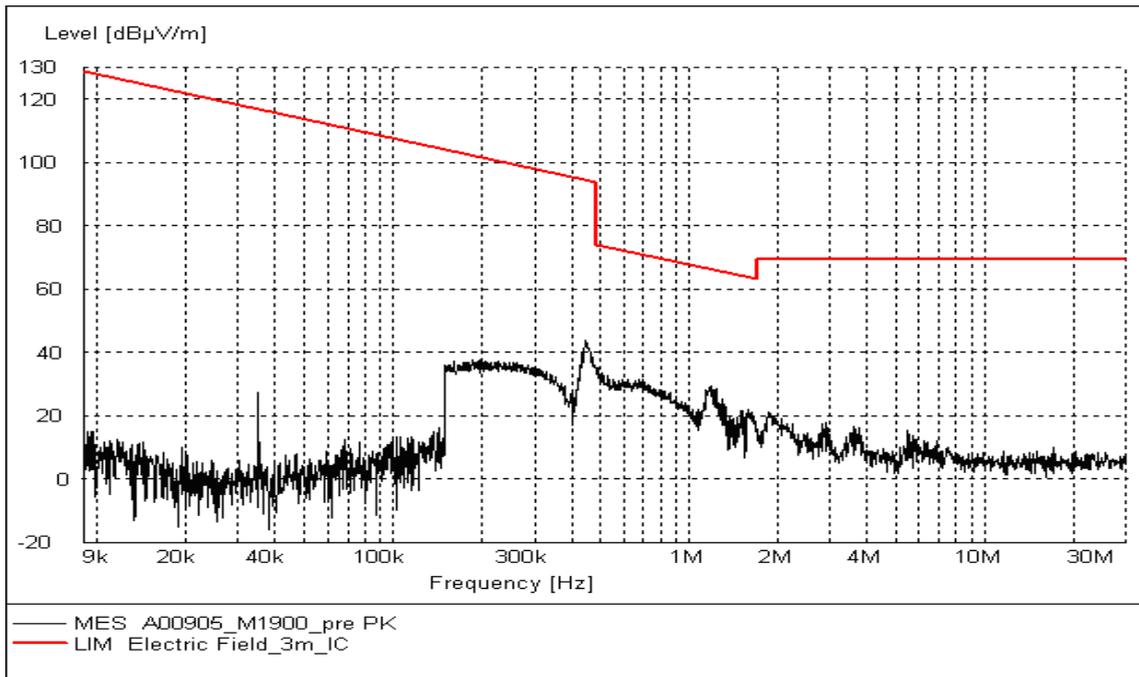
GSM 850

A.2.3.1 RADIATED SPURIOUS EMISSIONS-EUT in Traffic Mode: 9 kHz – 30 MHz (Worst case for 3 channels)



PCS 1900

A.2.3.2 RADIATED SPURIOUS EMISSIONS-EUT in Traffic Mode: 9 kHz – 30 MHz (Worst case for 3 channels)



A.3 CONDUCTED EMISSION

Reference

FCC: CFR Part 15.107/207

The measurement procedure in ANSI C63.4-2003 is used. Conducted Emission is measured with travel charger. For test layout photo, please refer to Pic.2 in Annex B.

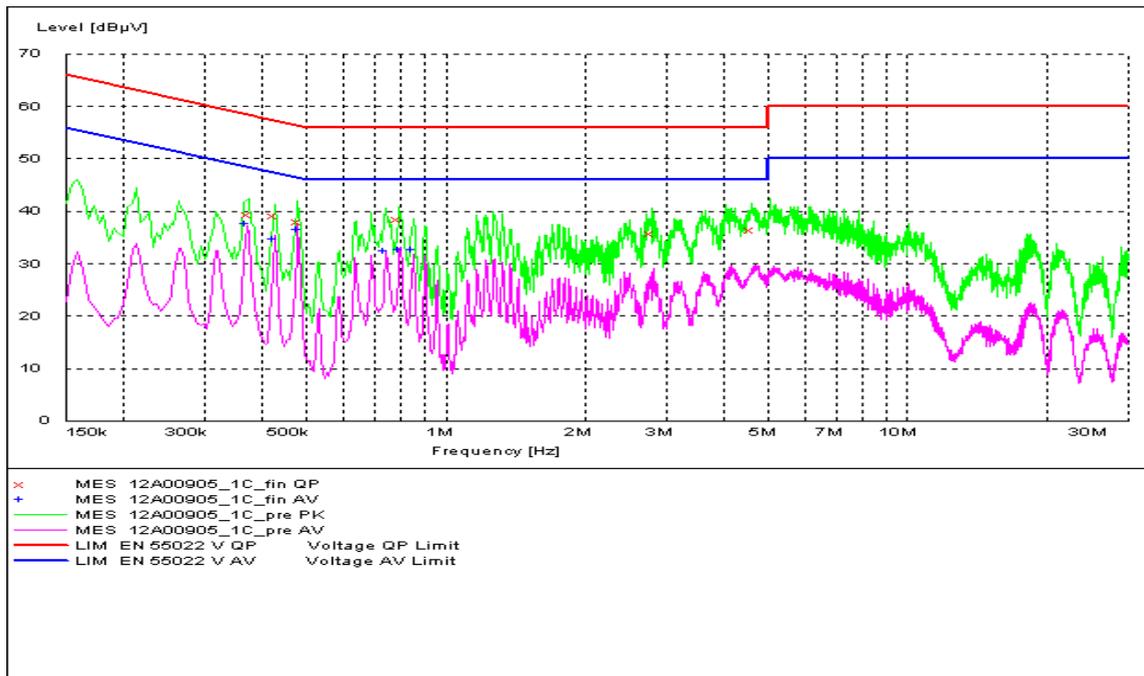
A.3.1 Limit

| Frequency of Emission (MHz) | Conducted Limit (dB μ V) | |
|--------------------------------|------------------------------|-----------|
| | Quasi -Peak | Average |
| 0.15 – 0.5 | 66 to 56* | 56 to 46* |
| 0.5 – 5 | 56 | 46 |
| 5 – 30 | 60 | 50 |

* Decreases with logarithm of the frequency

A.3.2 Measurement result

GSM850MHz



IF bandwidth 9 kHz

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

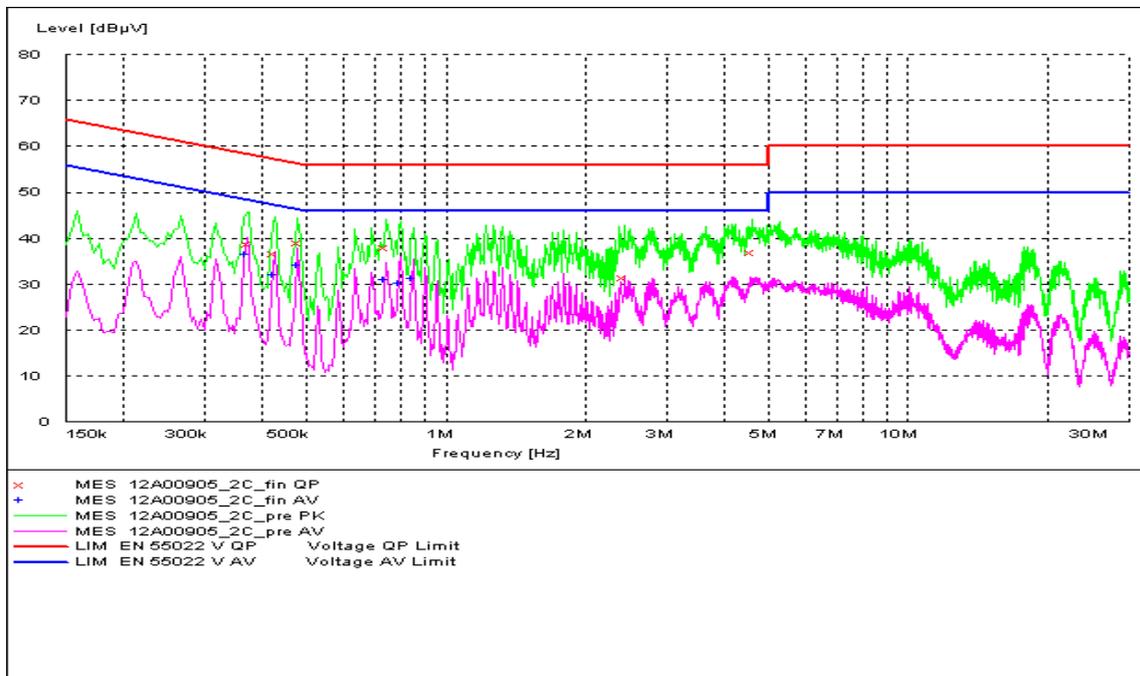
MEASUREMENT RESULT: "12A00905_1C_fin QP"

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Line | PE |
|---------------|------------|-----------|------------|-----------|------|-----|
| 0.375000 | 39.40 | 10.1 | 58 | 18.9 | L1 | GND |
| 0.424500 | 39.10 | 10.1 | 57 | 18.3 | L1 | GND |
| 0.478500 | 38.10 | 10.1 | 56 | 18.2 | N | GND |
| 0.793500 | 38.50 | 10.1 | 56 | 17.5 | L1 | GND |
| 2.803335 | 35.80 | 10.1 | 56 | 20.2 | L1 | GND |
| 4.592003 | 36.50 | 10.2 | 56 | 19.5 | L1 | GND |

MEASUREMENT RESULT: "12A00905_1C_fin AV"

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Line | PE |
|---------------|------------|-----------|------------|-----------|------|-----|
| 0.370500 | 37.60 | 10.1 | 49 | 10.9 | L1 | GND |
| 0.424500 | 34.60 | 10.1 | 47 | 12.8 | L1 | GND |
| 0.478500 | 36.50 | 10.1 | 46 | 9.8 | L1 | GND |
| 0.744000 | 32.30 | 10.1 | 46 | 13.7 | L1 | GND |
| 0.798000 | 32.60 | 10.1 | 46 | 13.4 | L1 | GND |
| 0.847500 | 32.50 | 10.1 | 46 | 13.5 | L1 | GND |

PCS 1900MHz



IF bandwidth 9 kHz

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

MEASUREMENT RESULT: "12A00905_2C_fin QP"

| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|------|-----|
| 0.375000 | 38.80 | 10.1 | 58 | 19.6 | L1 | GND |
| 0.424500 | 36.60 | 10.1 | 57 | 20.8 | N | GND |
| 0.478500 | 39.10 | 10.1 | 56 | 17.3 | L1 | GND |
| 0.739500 | 38.10 | 10.1 | 56 | 17.9 | L1 | GND |
| 2.437443 | 31.40 | 10.1 | 56 | 24.6 | N | GND |
| 4.592003 | 37.00 | 10.2 | 56 | 19.0 | L1 | GND |

MEASUREMENT RESULT: "12A00905_2C_fin AV"

| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|------|-----|
| 0.370500 | 36.50 | 10.1 | 49 | 12.0 | L1 | GND |
| 0.424500 | 31.90 | 10.1 | 47 | 15.5 | N | GND |
| 0.478500 | 34.20 | 10.1 | 46 | 12.2 | N | GND |
| 0.739500 | 31.00 | 10.1 | 46 | 15.0 | L1 | GND |
| 0.798000 | 30.10 | 10.1 | 46 | 15.9 | N | GND |
| 0.847500 | 31.20 | 10.1 | 46 | 14.8 | N | GND |

A.4 FREQUENCY STABILITY

Reference

FCC: CFR Part 2.1055, 22.235, 24.235

IC: RSS 132, Issue 2, Section 4.3. RSS 133, Issue 5, Section 6.3

A.4.1 Method of Measurement

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on channel 661 for PCS 1900, channel 190 for GSM850 measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50°C to -30°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

A.4.2 Measurement Limit

A.4.2.1 For Hand carried battery powered equipment

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.5VDC and 4.1VDC, with a nominal voltage of 3.7VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

A.4.2.2 For equipment powered by primary supply voltage

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet section 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

A.4.3 Measurement results

GSM 850

Room Temperature: 23 °C

Frequency Error vs Voltage

| Voltage(V) | Frequency error(Hz) | Frequency error(ppm) |
|------------|---------------------|----------------------|
| 3.5 | -28 | 0.024 |
| 3.7 | -28 | 0.023 |
| 4.1 | -29 | 0.026 |

Frequency Error vs Temperature

| temperature(°C) | Frequency error(Hz) | Frequency error(ppm) |
|-----------------|---------------------|----------------------|
| -30 | -29 | 0.025 |
| -20 | -29 | 0.025 |
| -10 | -29 | 0.024 |
| 0 | -28 | 0.024 |
| 10 | -28 | 0.023 |
| 20 | -28 | 0.023 |
| 30 | -28 | 0.024 |
| 40 | -29 | 0.025 |
| 50 | -29 | 0.026 |

Expanded measurement uncertainty for this test item is 10 Hz, k=2

PCS 1900**Room Temperature: 23°C****Frequency Error vs Voltage**

| Voltage(V) | Frequency error(Hz) | Frequency error(ppm) |
|------------|---------------------|----------------------|
| 3.5 | 45 | 0.010 |
| 3.7 | 45 | 0.011 |
| 4.1 | 45 | 0.011 |

Frequency Error vs Temperature

| temperature(°C) | Frequency error(Hz) | Frequency error(ppm) |
|-----------------|---------------------|----------------------|
| -30 | 48 | 0.011 |
| -20 | 47 | 0.011 |
| -10 | 47 | 0.011 |
| 0 | 45 | 0.010 |
| 10 | 45 | 0.010 |
| 20 | 45 | 0.010 |
| 30 | 45 | 0.011 |
| 40 | 45 | 0.011 |
| 50 | 47 | 0.012 |

Expanded measurement uncertainty for this test item is 10 Hz, k=2

A.5 OCCUPIED BANDWIDTH

Reference

FCC: CFR Part 2.1049(h)(i)

IC: RSS 132, Issue 2, Section 4.2. RSS 133, Issue 5, Section 6.2.

A.5.1 Occupied Bandwidth Results

Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the US Cellular/PCS frequency bands. The table below lists the measured -20dBc BW (99%). Spectrum analyzer plots are included on the following pages.

Measurement Parameters:

RBW = 5 kHz, VBW = 10 kHz

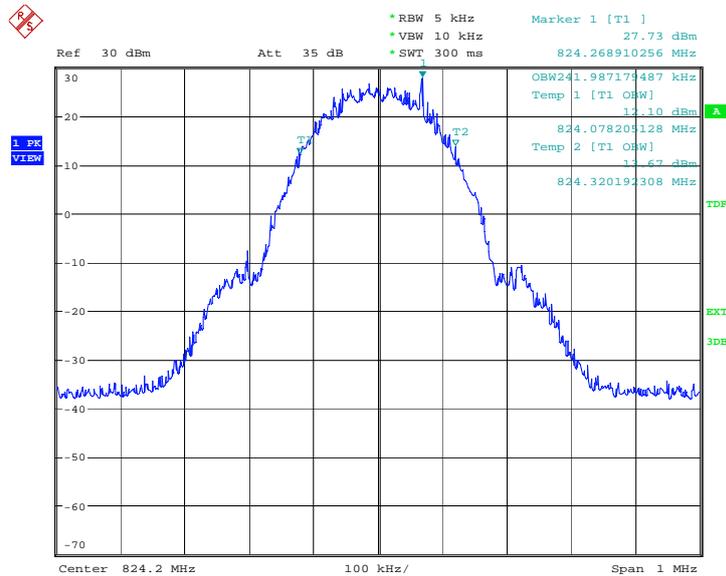
GSM 850(99%)

| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |
|----------------|--------------------------------|
| 824.2 | 241.987 |
| 836.6 | 243.590 |
| 848.8 | 238.782 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

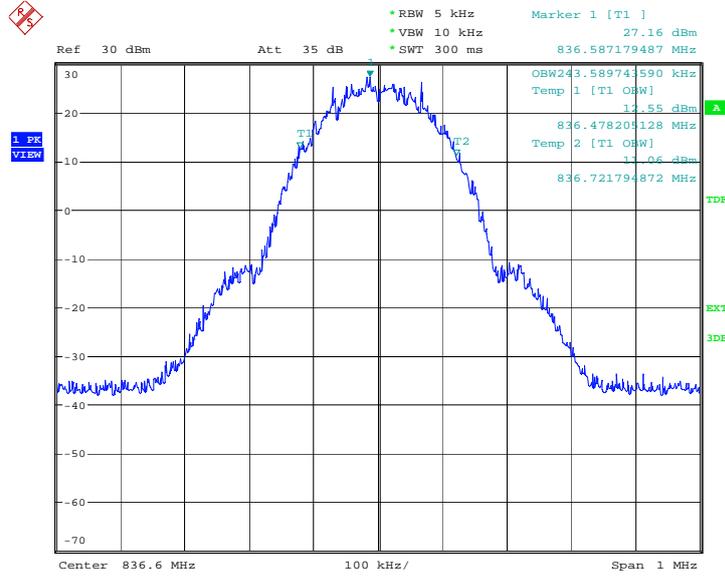
GSM 850

Channel 128-Occupied Bandwidth (-20dBc BW)



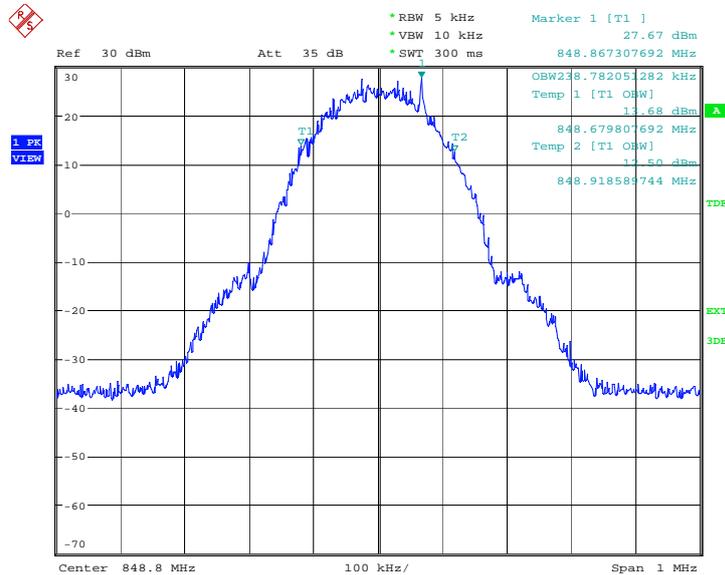
Date: 24.FEB.2012 06:51:38

Channel 190-Occupied Bandwidth (-20dBc BW)



Date: 24.FEB.2012 06:52:10

Channel 251-Occupied Bandwidth (-20dBc BW)



Date: 24.FEB.2012 06:52:42

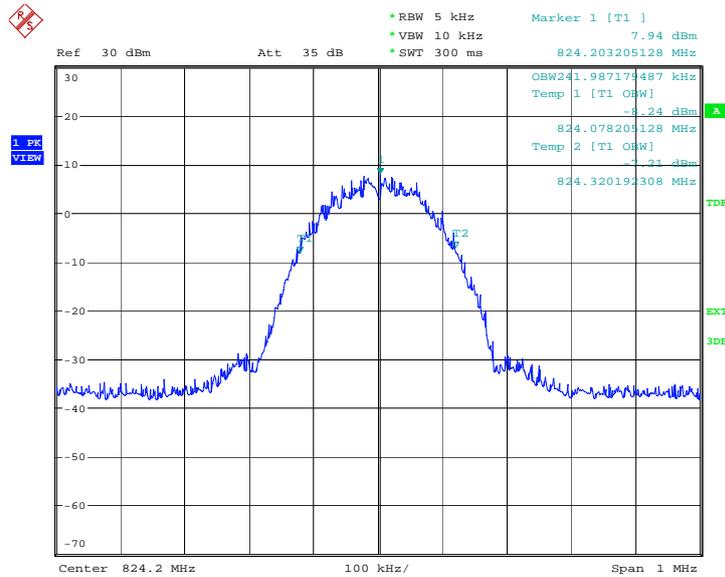
GPRS 850(99%)

| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |
|----------------|--------------------------------|
| 824.2 | 241.987 |
| 836.6 | 237.179 |
| 848.8 | 241.987 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

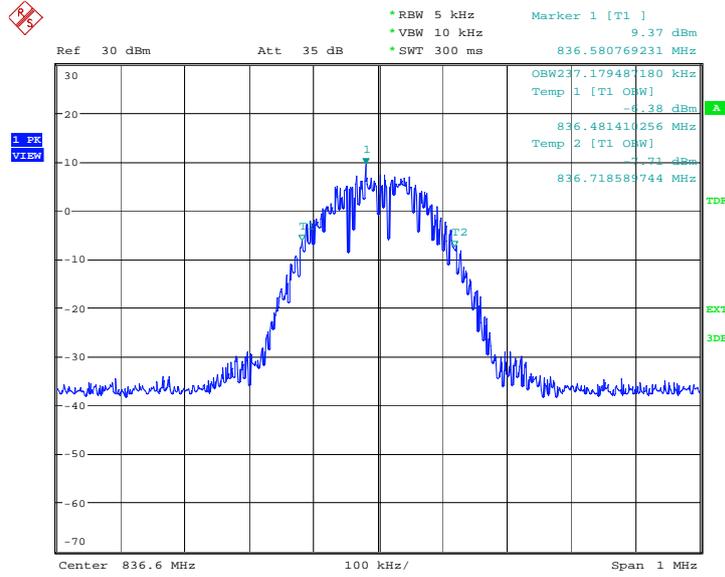
GPRS 850

Channel 128-Occupied Bandwidth (-20dBc BW)



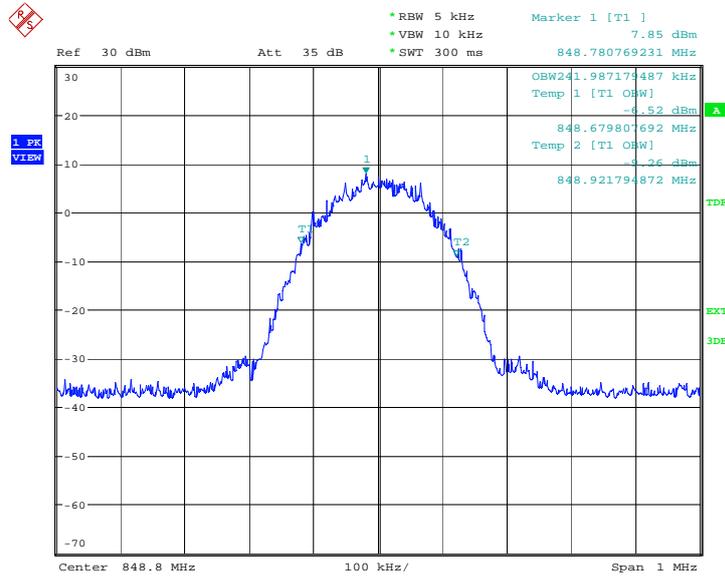
Date: 24.FEB.2012 07:25:51

Channel 190-Occupied Bandwidth (-20dBc BW)



Date: 24.FEB.2012 07:26:23

Channel 251-Occupied Bandwidth (-20dBc BW)



Date: 24.FEB.2012 07:26:55

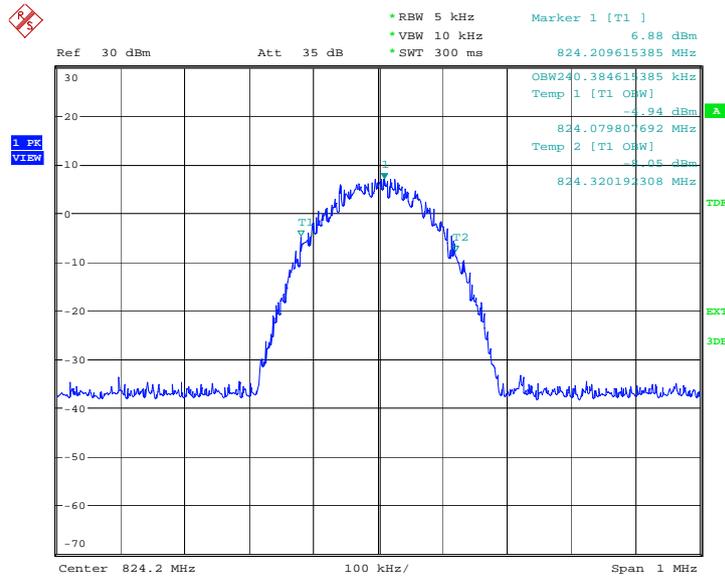
EGPRS 850(99%)

| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |
|----------------|--------------------------------|
| 824.2 | 240.385 |
| 836.6 | 240.385 |
| 848.8 | 240.385 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

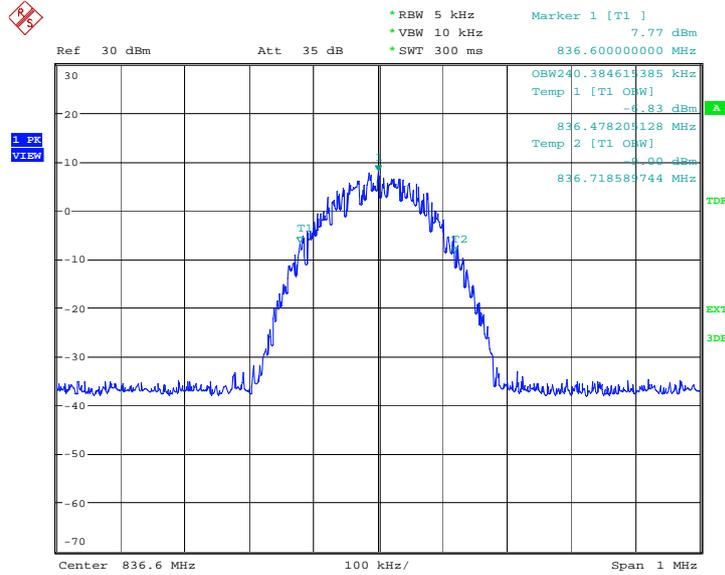
EGPRS 850

Channel 128-Occupied Bandwidth (-20dBc BW)



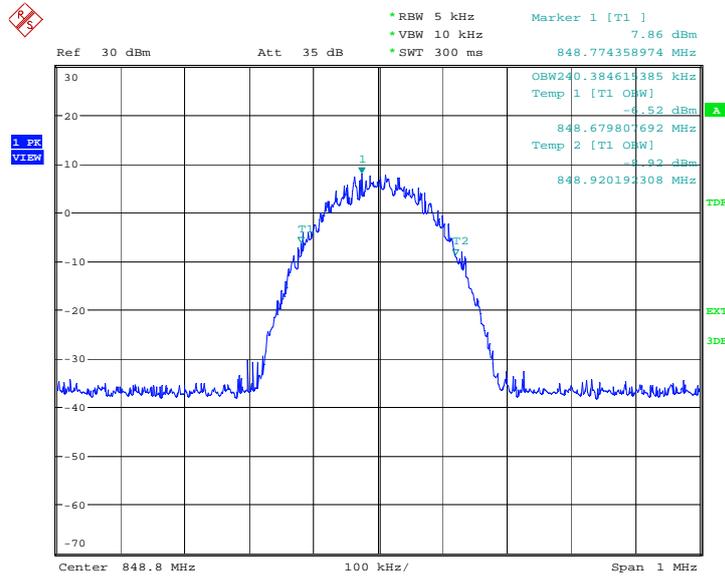
Date: 24.FEB.2012 07:36:29

Channel 190-Occupied Bandwidth (-20dBc BW)



Date: 24.FEB.2012 07:37:01

Channel 251-Occupied Bandwidth (-20dBc BW)



Date: 24.FEB.2012 07:37:33

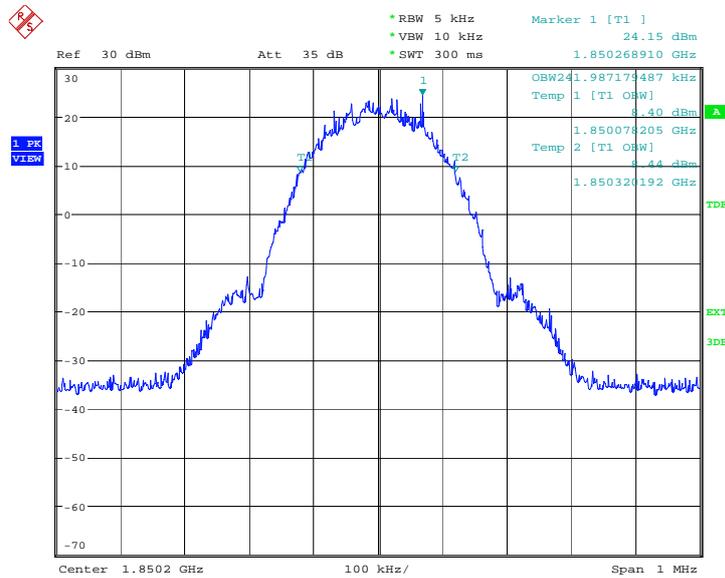
PCS 1900(99%)

| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |
|----------------|--------------------------------|
| 1850.2 | 241.987 |
| 1880.0 | 241.987 |
| 1909.8 | 243.590 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

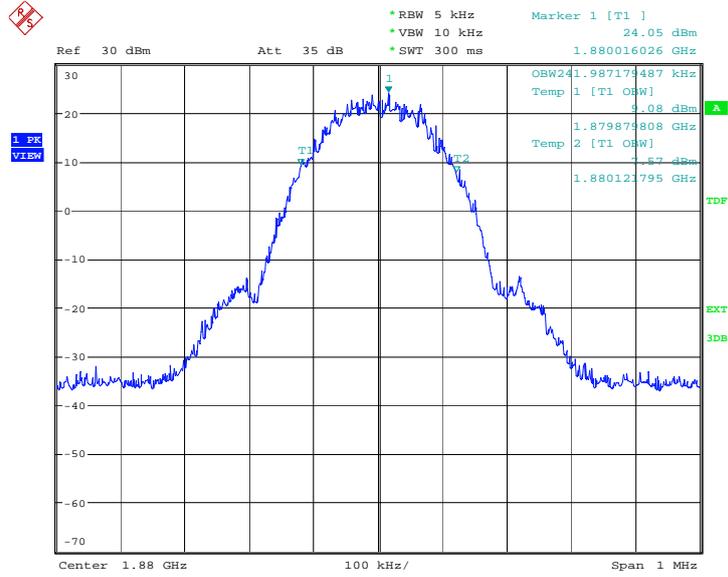
PCS 1900

Channel 512-Occupied Bandwidth (-20dBc BW)



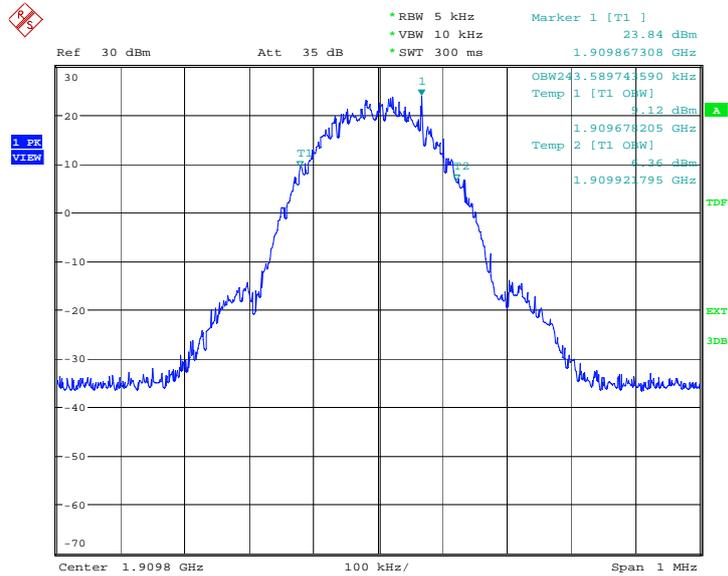
Date: 24.FEB.2012 07:08:16

Channel 661-Occupied Bandwidth (-20dBc BW)



Date: 24.FEB.2012 07:08:49

Channel 810-Occupied Bandwidth (-20dBc BW)



Date: 24.FEB.2012 07:09:21

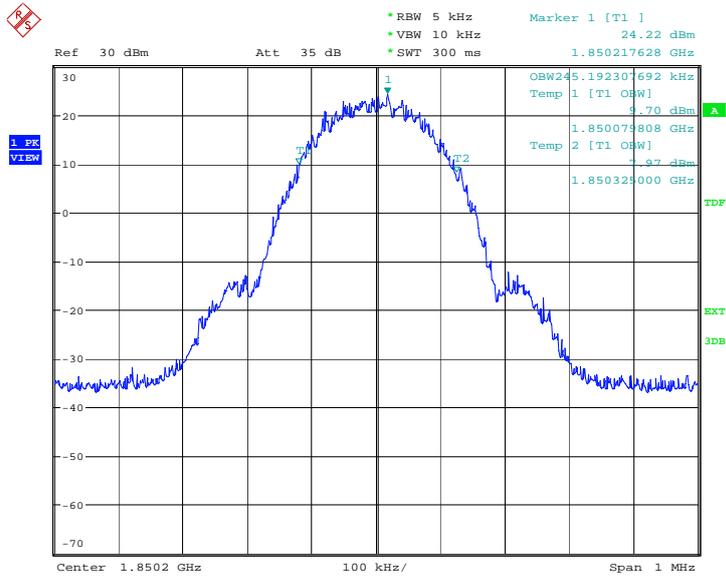
GPRS 1900(99%)

| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |
|----------------|--------------------------------|
| 1850.2 | 245.192 |
| 1880.0 | 240.385 |
| 1909.8 | 241.987 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

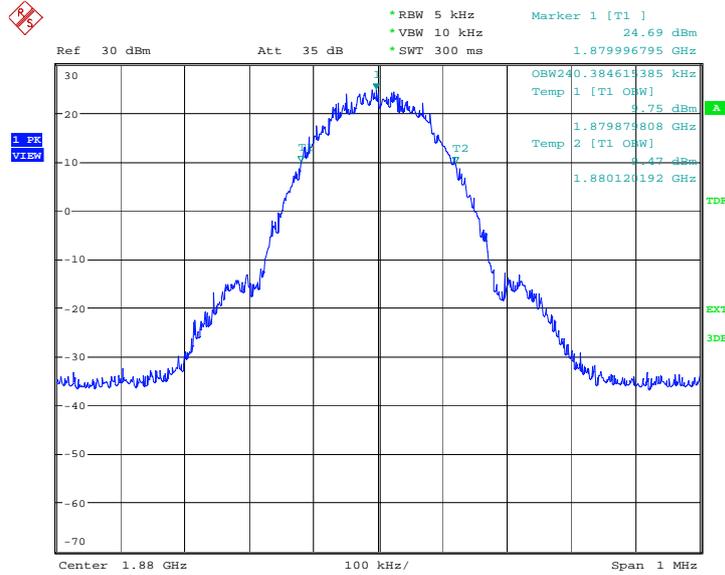
GPRS 1900

Channel 512-Occupied Bandwidth -20dBc BW)



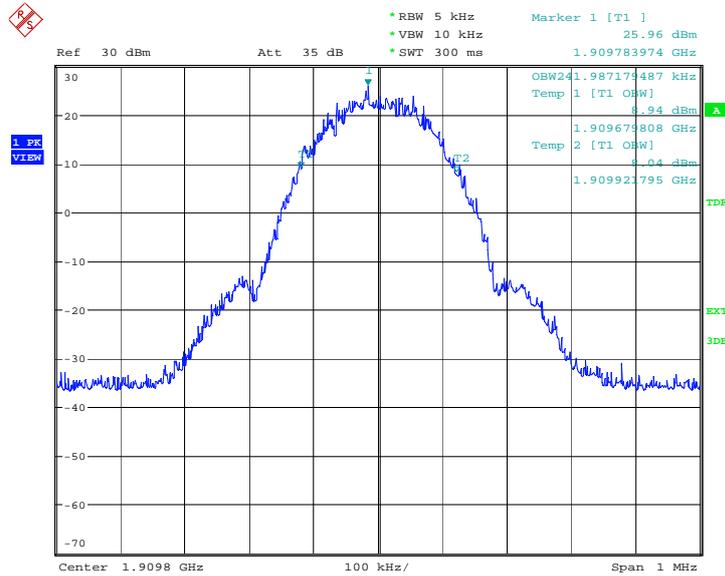
Date: 2.MAR.2012 07:04:07

Channel 661-Occupied Bandwidth (-20dBc BW)



Date: 2.MAR.2012 07:05:03

Channel 810-Occupied Bandwidth (-20dBc BW)



Date: 2.MAR.2012 07:05:49

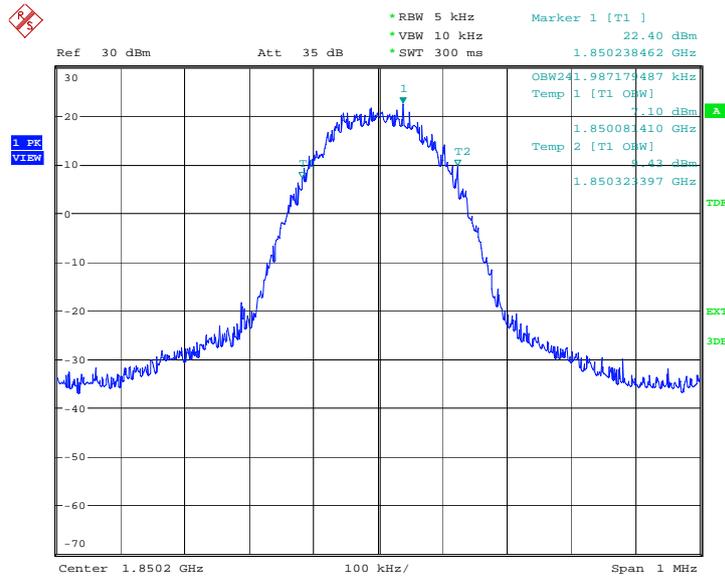
EGPRS 1900(99%)

| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |
|----------------|--------------------------------|
| 1850.2 | 241.987 |
| 1880.0 | 243.590 |
| 1909.8 | 241.987 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

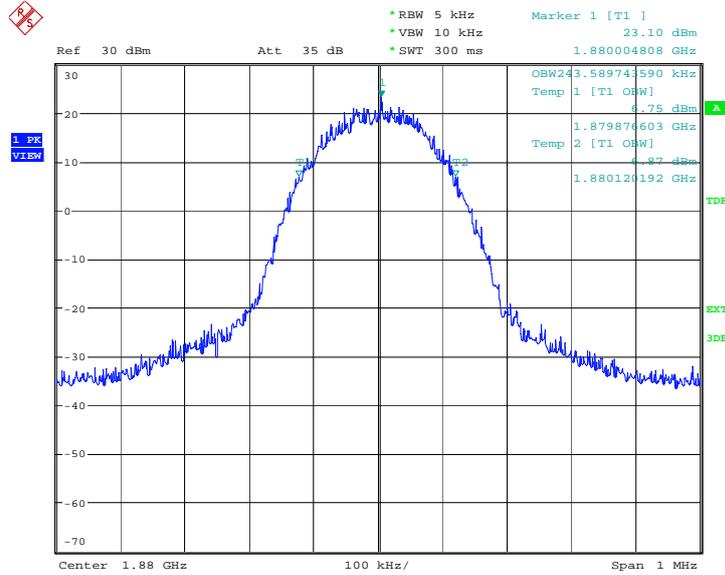
EGPRS 1900

Channel 512-Occupied Bandwidth (-20dBc BW)



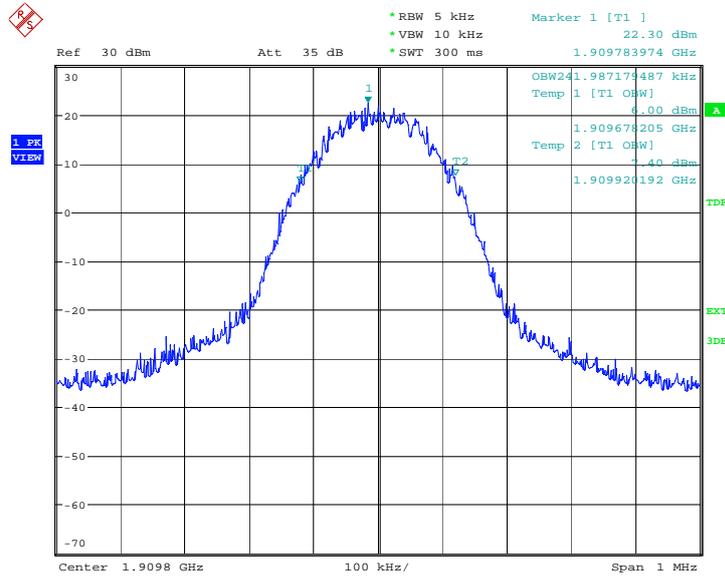
Date: 2.MAR.2012 06:50:12

Channel 661-Occupied Bandwidth (-20dBc BW)



Date: 2.MAR.2012 06:50:53

Channel 810-Occupied Bandwidth (-20dBc BW)



Date: 2.MAR.2012 06:51:38

A.6 EMISSION BANDWIDTH

Reference

FCC: CFR Part 22.917(b), 24.238(b)

IC: RSS 132, Issue 2, Section 4.2. RSS 133, Issue 5, Section 6.2.

A.6.1 Emission Bandwidth Results

Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the PCS1900 band and GSM850 band. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

Measurement Parameters:

RBW = 5KHz, VBW = 10KHz

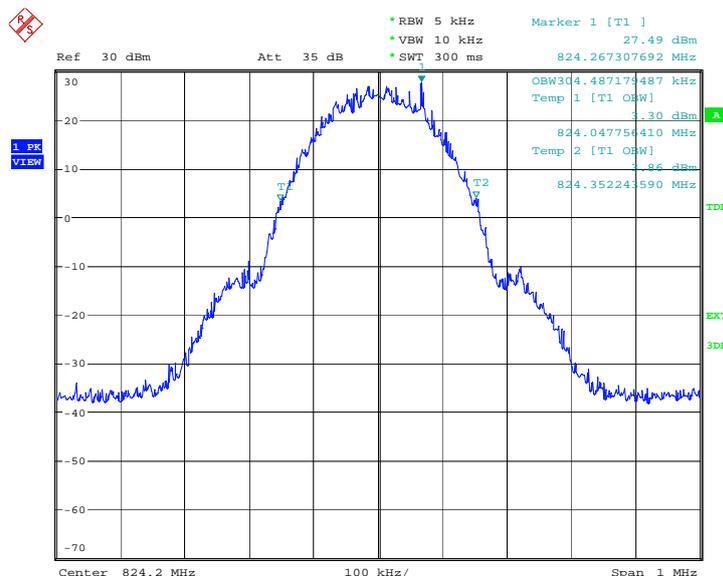
GSM 850(-26dBc)

| Frequency(MHz) | Occupied Bandwidth (-26dBc BW)(kHz) |
|----------------|--------------------------------------|
| 824.2 | 304.487 |
| 836.6 | 302.885 |
| 848.8 | 302.885 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

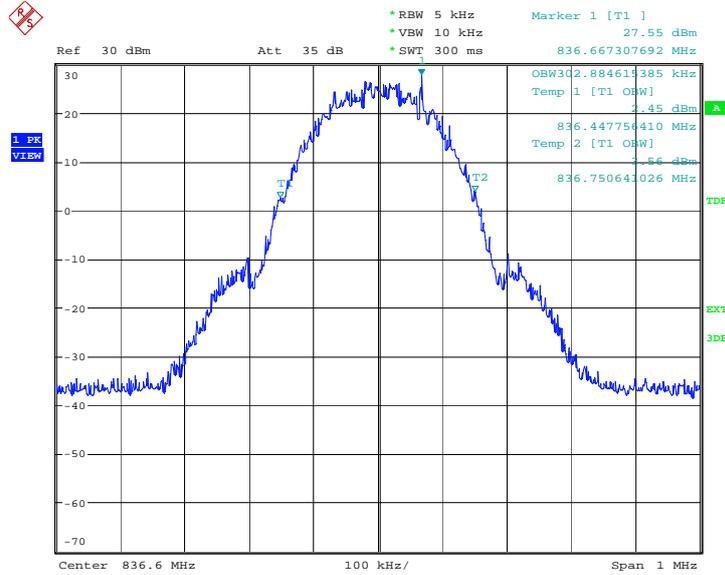
GSM 850

Channel 128-Occupied Bandwidth (-26dBc BW)



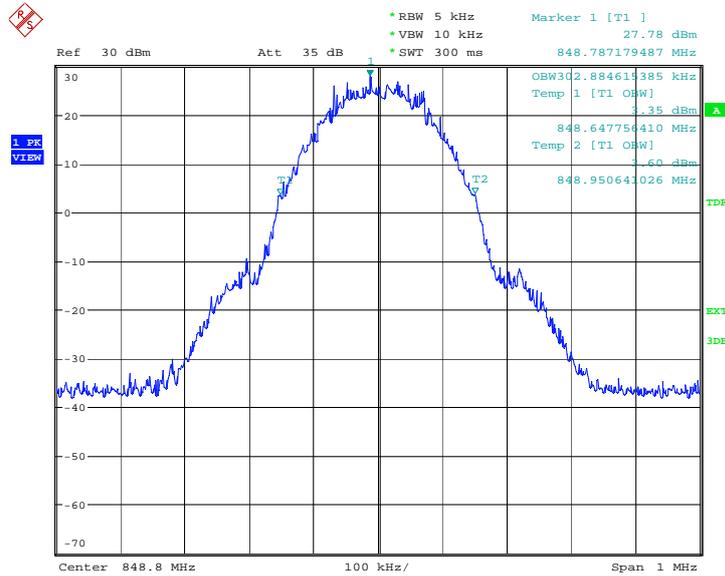
Date: 24.FEB.2012 08:18:59

Channel 190-Occupied Bandwidth (-26dBc BW)



Date: 24.FEB.2012 08:19:31

Channel 251-Occupied Bandwidth (-26dBc BW)



Date: 24.FEB.2012 08:20:03

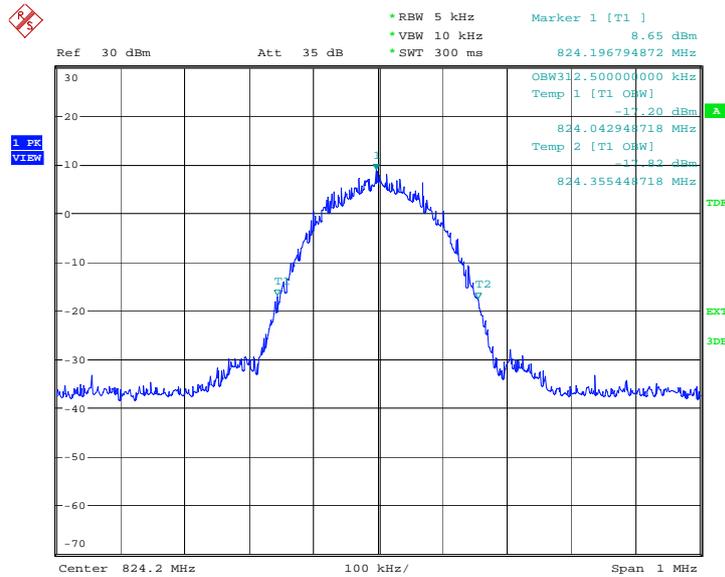
GPRS 850(-26dBc)

| Frequency(MHz) | Occupied Bandwidth (-26dBc BW)(kHz) |
|----------------|--------------------------------------|
| 824.2 | 312.500 |
| 836.6 | 309.295 |
| 848.8 | 306.090 |

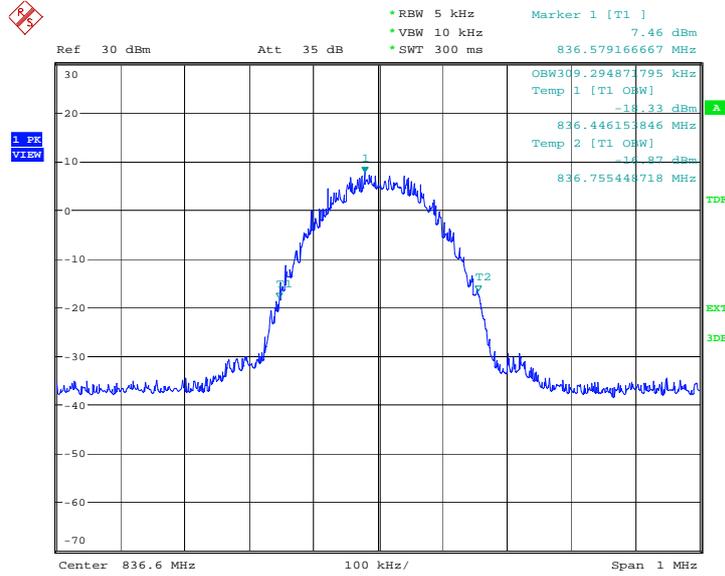
Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

GPRS 850

Channel 128-Occupied Bandwidth (-26dBc BW)

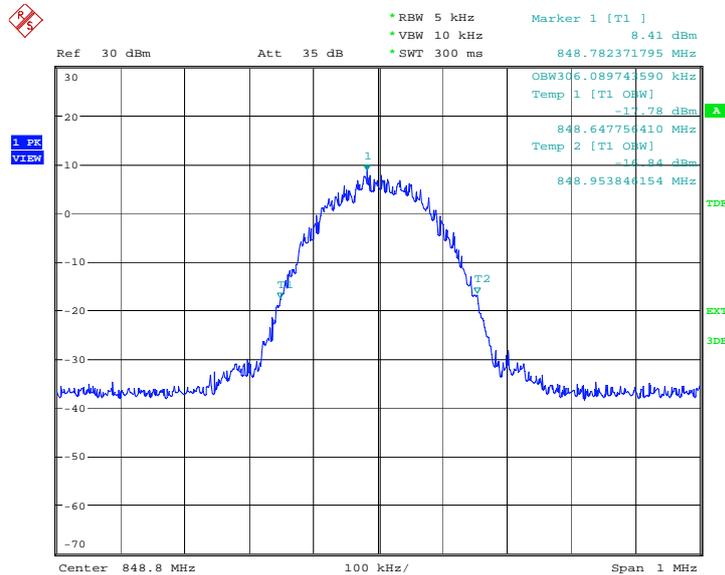


Channel 190-Occupied Bandwidth (-26dBc BW)



Date: 24.FEB.2012 07:28:01

Channel 251-Occupied Bandwidth (-26dBc BW)



Date: 24.FEB.2012 07:28:34

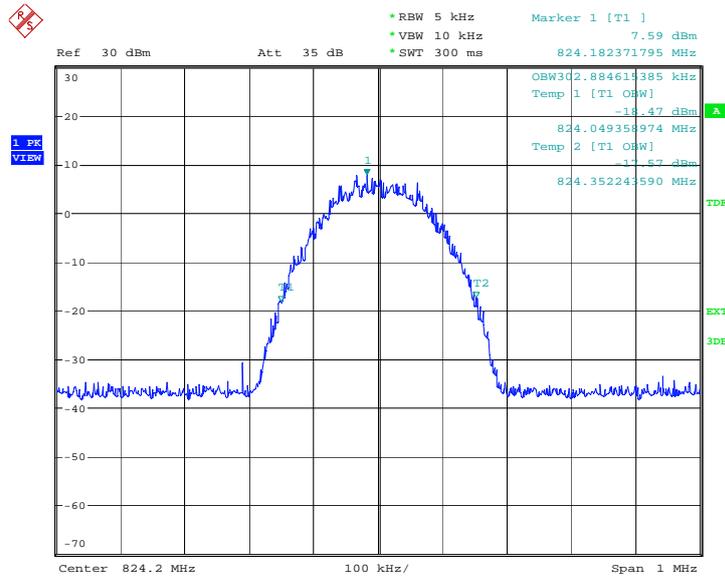
EGPRS 850(-26dBc)

| Frequency(MHz) | Occupied Bandwidth (-26dBc BW)(kHz) |
|----------------|--------------------------------------|
| 824.2 | 302.885 |
| 836.6 | 299.679 |
| 848.8 | 301.282 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

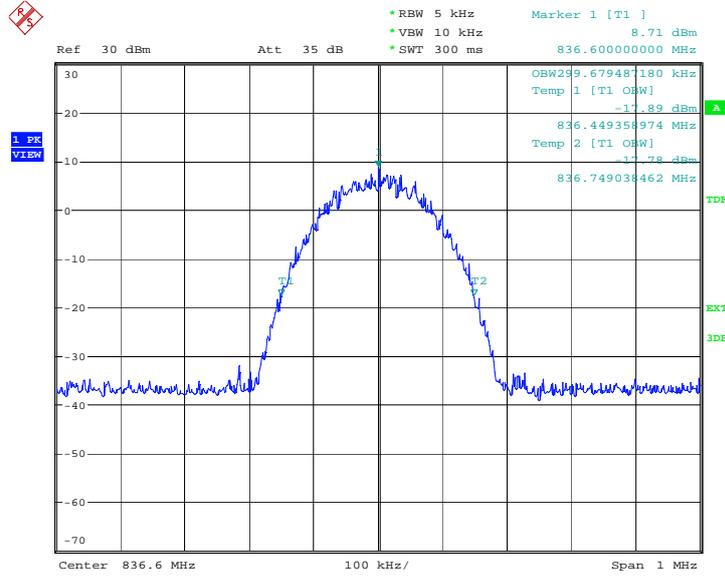
EGPRS 850

Channel 128-Occupied Bandwidth (-26dBc BW)



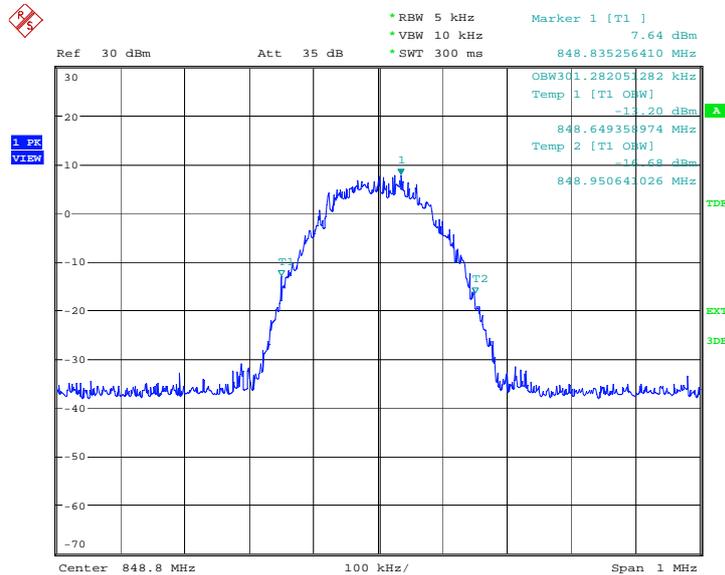
Date: 24.FEB.2012 07:38:07

Channel 190-Occupied Bandwidth (-26dBc BW)



Date: 24.FEB.2012 07:38:39

Channel 251-Occupied Bandwidth (-26dBc BW)



Date: 24.FEB.2012 07:39:11

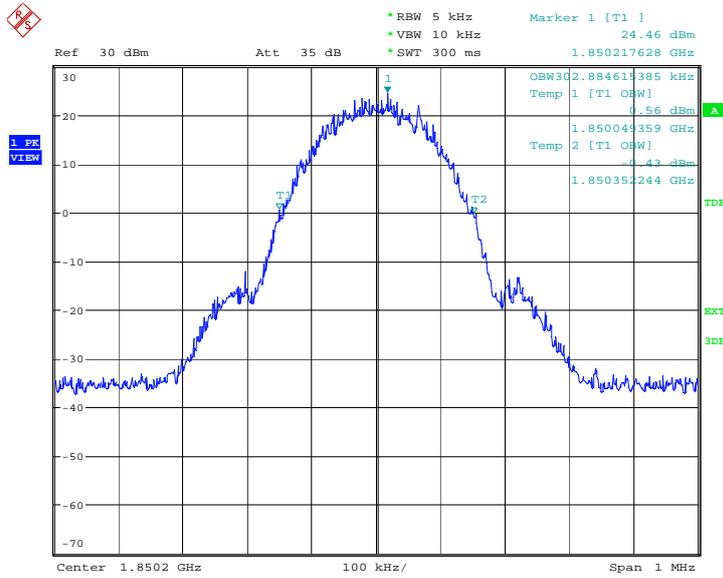
PCS 1900(-26dBc)

| Frequency(MHz) | Occupied Bandwidth (-26dBc BW)(kHz) |
|----------------|--------------------------------------|
| 1850.2 | 302.885 |
| 1880.0 | 304.487 |
| 1909.8 | 301.282 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

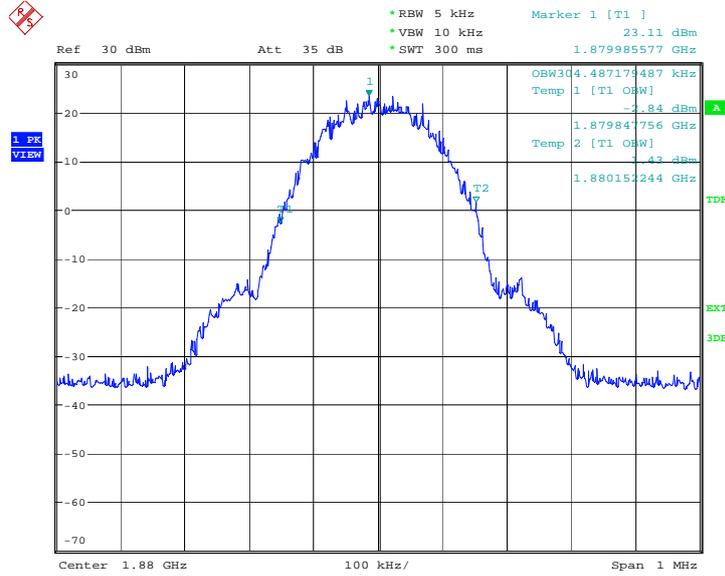
PCS 1900

Channel 512-Occupied Bandwidth (-26dBc BW)



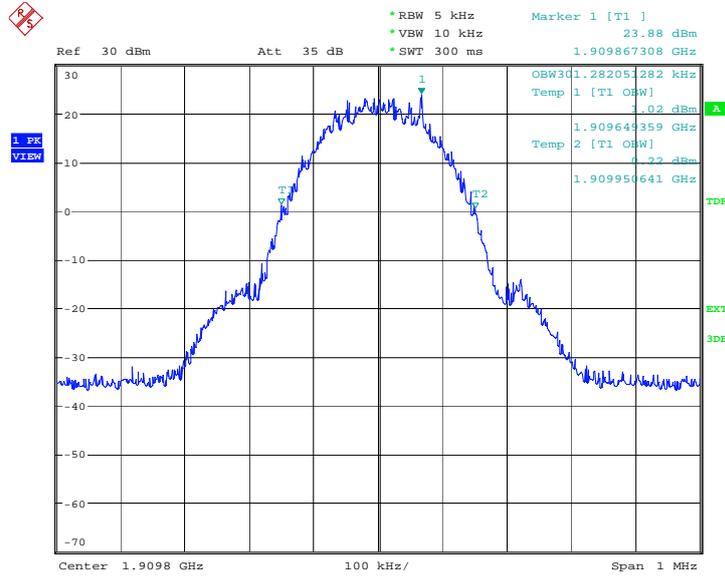
Date: 24.FEB.2012 07:09:55

Channel 661-Occupied Bandwidth (-26dBc BW)



Date: 24.FEB.2012 07:10:27

Channel 810-Occupied Bandwidth (-26dBc BW)



Date: 24.FEB.2012 07:10:59

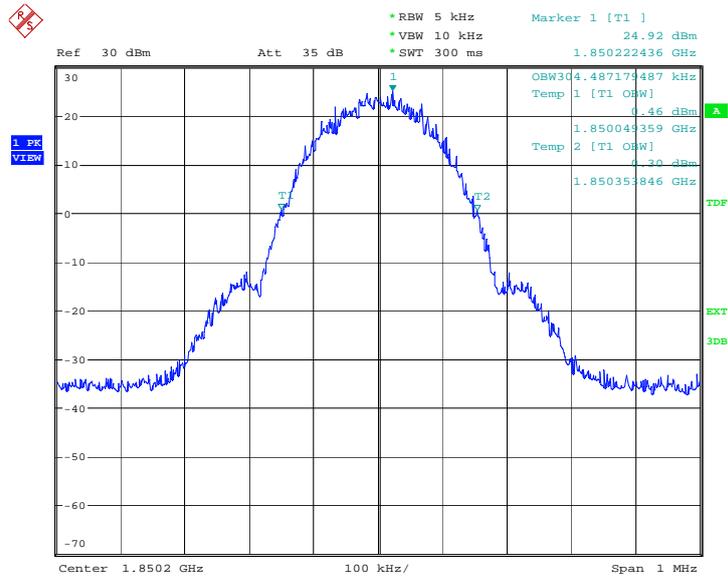
GPRS 1900(-26dBc)

| Frequency(MHz) | Occupied Bandwidth (-26dBc BW)(kHz) |
|----------------|--------------------------------------|
| 1850.2 | 304.487 |
| 1880.0 | 302.885 |
| 1909.8 | 304.487 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

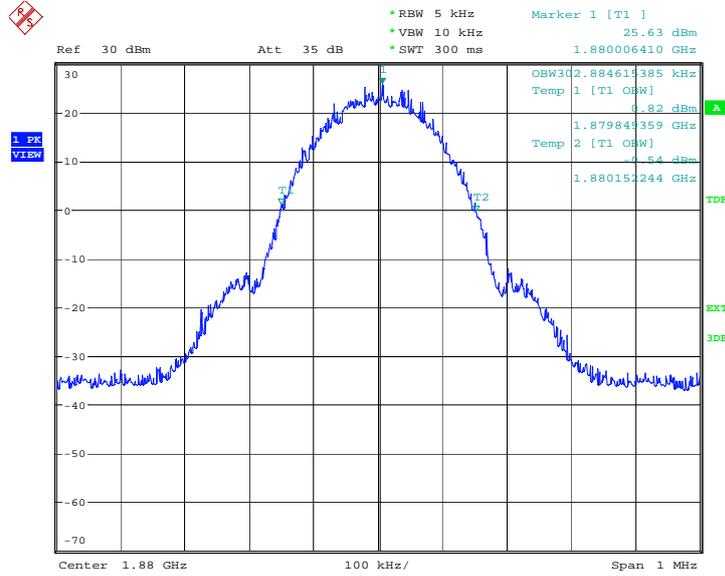
GPRS 1900

Channel 512-Occupied Bandwidth (-26dBc BW)



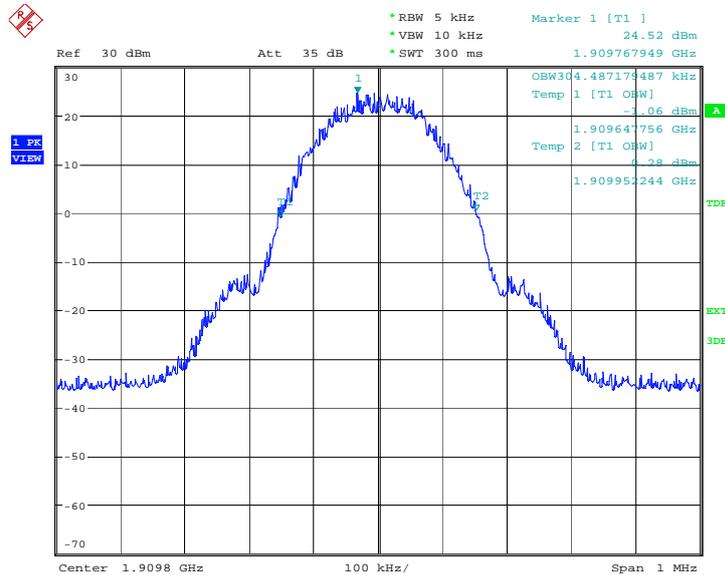
Date: 2.MAR.2012 07:06:34

Channel 661-Occupied Bandwidth (-26dBc BW)



Date: 2.MAR.2012 07:07:19

Channel 810-Occupied Bandwidth (-26dBc BW)



Date: 2.MAR.2012 07:08:01

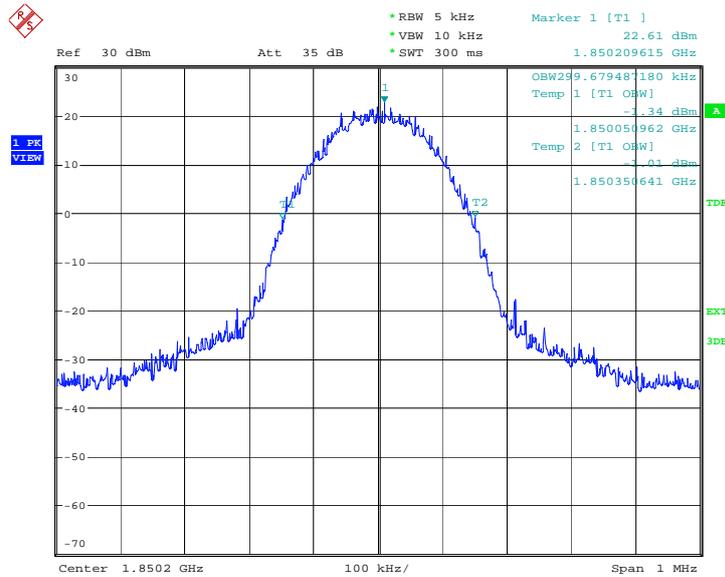
EGPRS 1900(-26dBc)

| Frequency(MHz) | Occupied Bandwidth (-26dBc BW)(kHz) |
|----------------|--------------------------------------|
| 1850.2 | 299.679 |
| 1880.0 | 302.885 |
| 1909.8 | 302.885 |

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

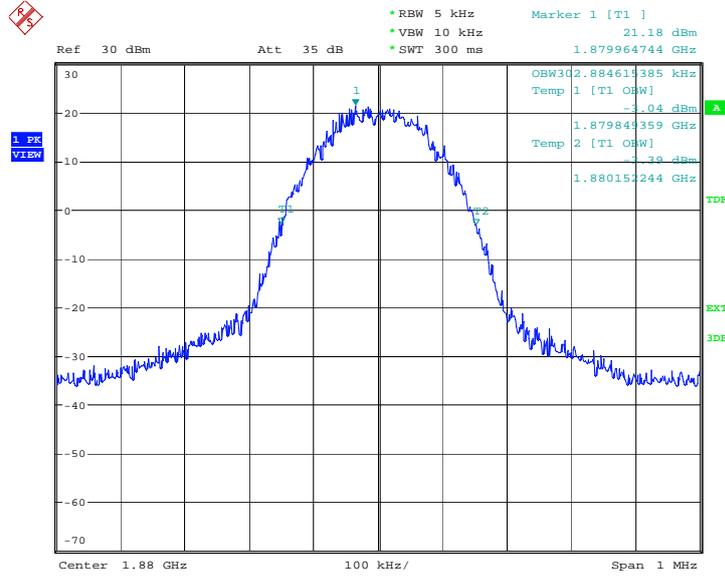
EGPRS 1900

Channel 512-Occupied Bandwidth (-26dBc BW)



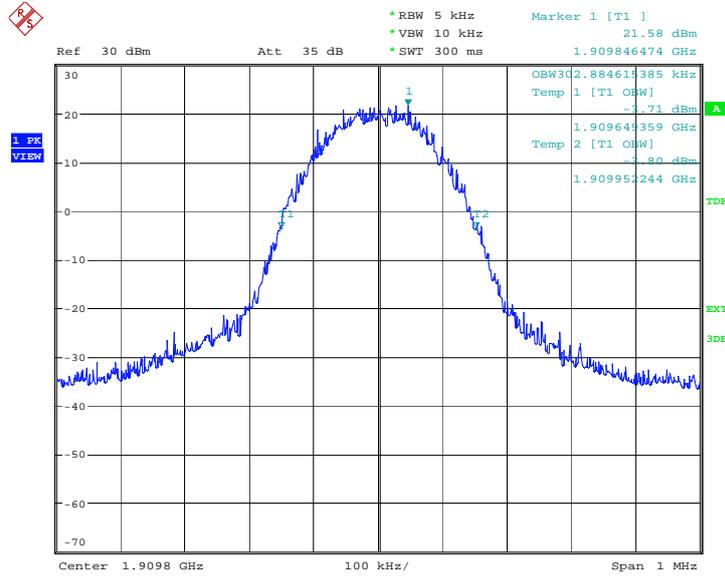
Date: 2.MAR.2012 06:52:25

Channel 661-Occupied Bandwidth (-26dBc BW)



Date: 2.MAR.2012 06:53:10

Channel 810-Occupied Bandwidth (-26dBc BW)



Date: 2.MAR.2012 06:53:50

A.7 BAND EDGE COMPLIANCE

Reference

FCC: CFR Part 22.917(b), 24.238(b)

IC: RSS 132, Issue 2, Section 4.5. RSS 133, Issue 5, Section 6.5

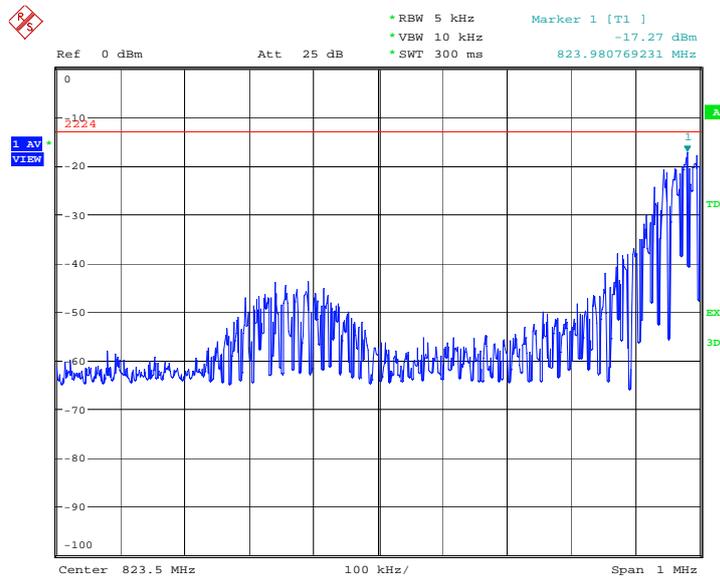
A.7.1 Measurement limit

On any frequency outside frequency band of the US Cellular/PCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43+10\text{Log}(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

A.7.2 Measurement result

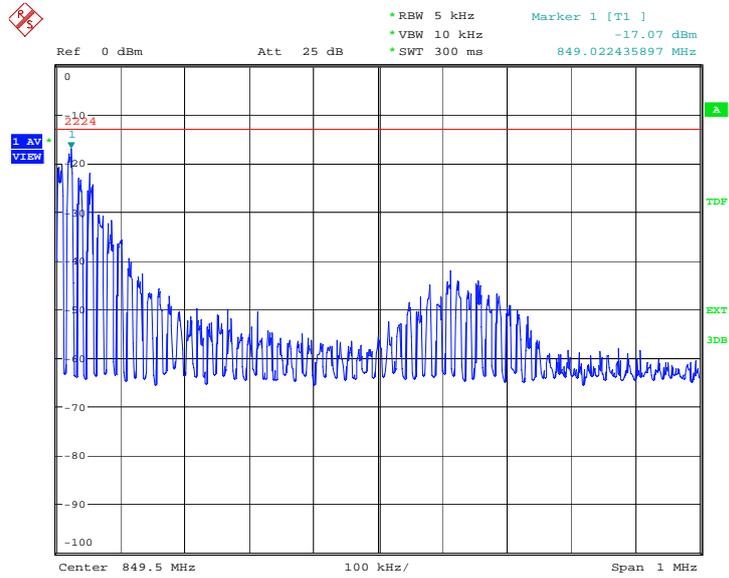
GSM 850

LOW BAND EDGE BLOCK-A (GSM850)-Channel 128



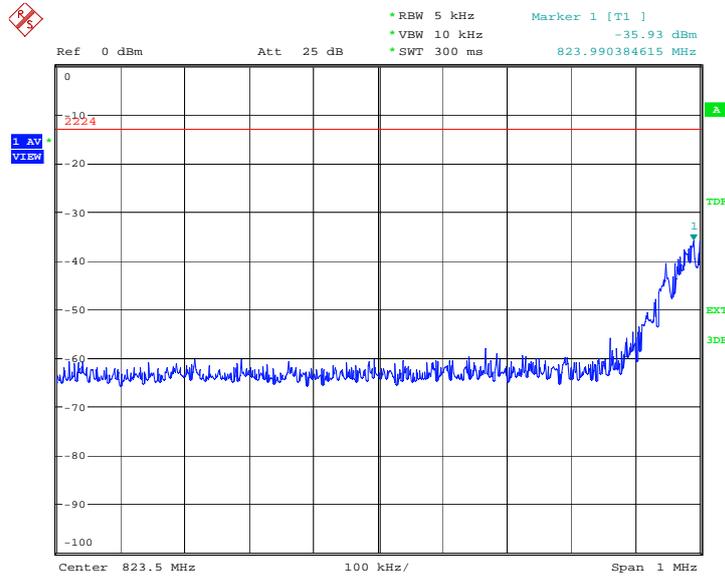
Date: 24.FEB.2012 06:54:30

HIGH BAND EDGE BLOCK-C (GSM850) –Channel 251



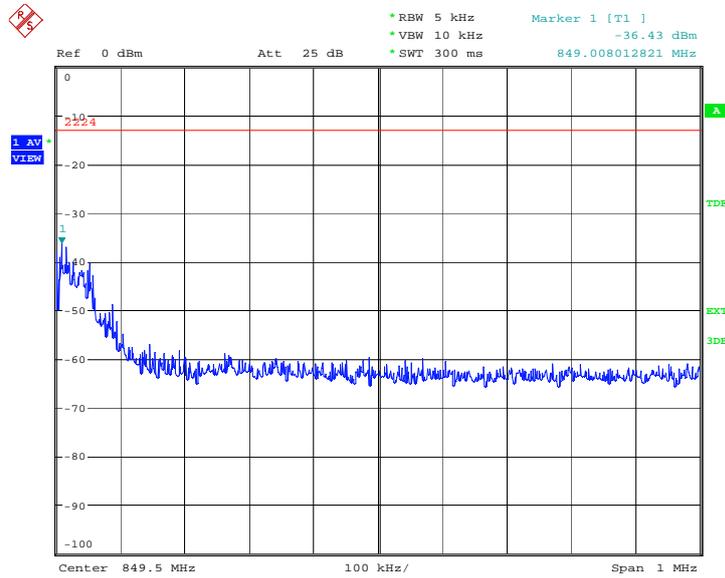
Date: 24.FEB.2012 06:54:39

GPRS 850
LOW BAND EDGE BLOCK-A (GSM850)-Channel 128



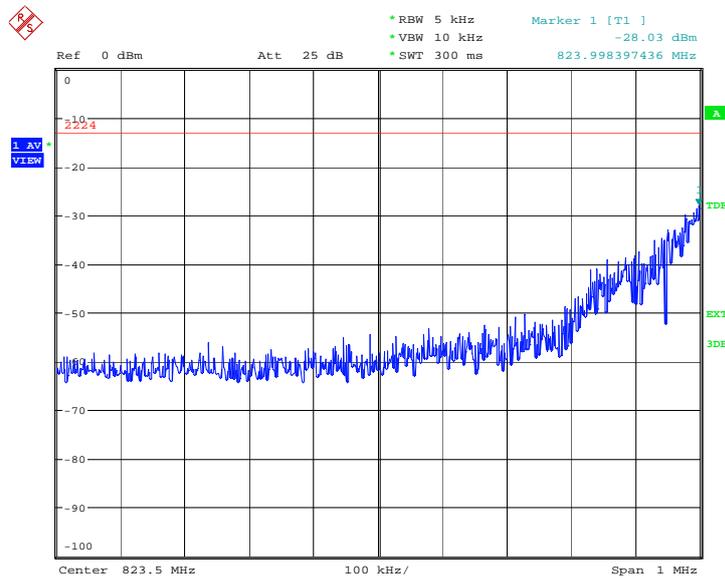
Date: 24.FEB.2012 07:28:42

HIGH BAND EDGE BLOCK-C (GSM850) –Channel 251



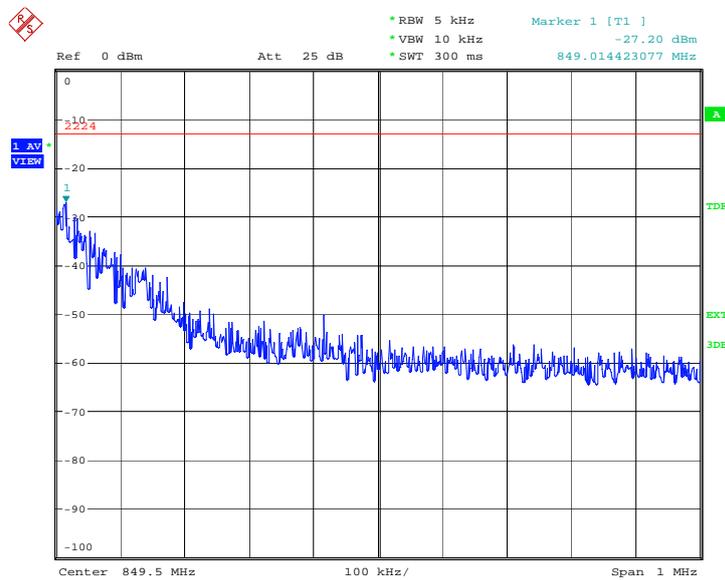
Date: 24.FEB.2012 07:28:51

EGPRS 850
LOW BAND EDGE BLOCK-A (GSM850)-Channel 128



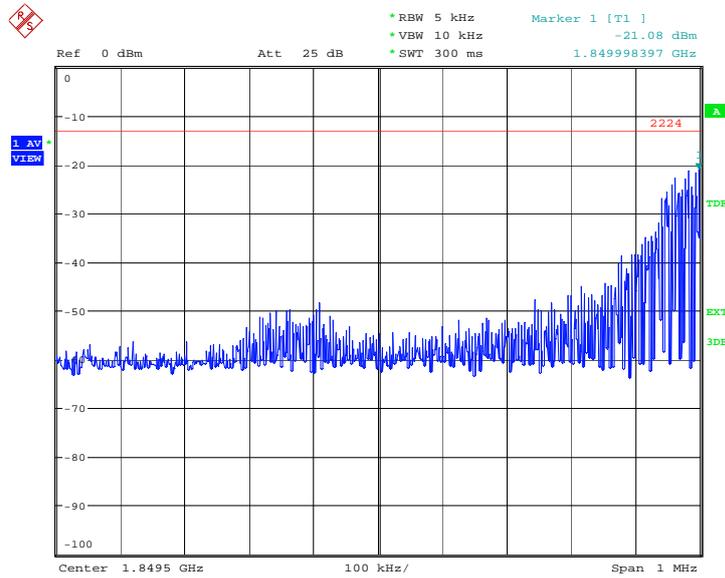
Date: 2.MAR.2012 07:16:59

HIGH BAND EDGE BLOCK-C (GSM850) –Channel 251



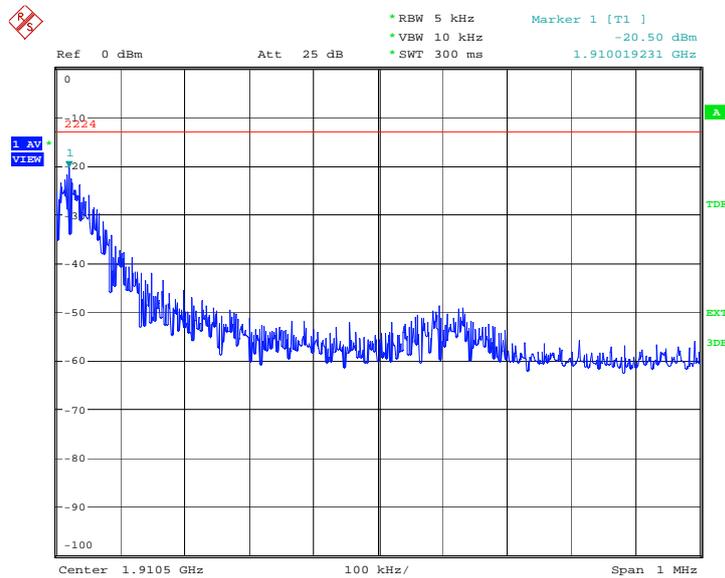
Date: 2.MAR.2012 07:17:21

PCS 1900
LOW BAND EDGE BLOCK-A (PCS-1900)-Channel 512



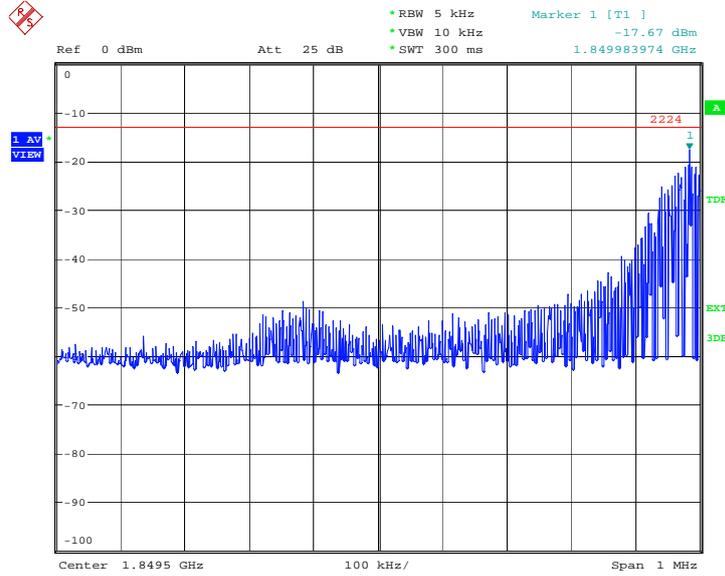
Date: 24.FEB.2012 07:11:08

HIGH BAND EDGE BLOCK-C (PCS-1900) -Channel 810



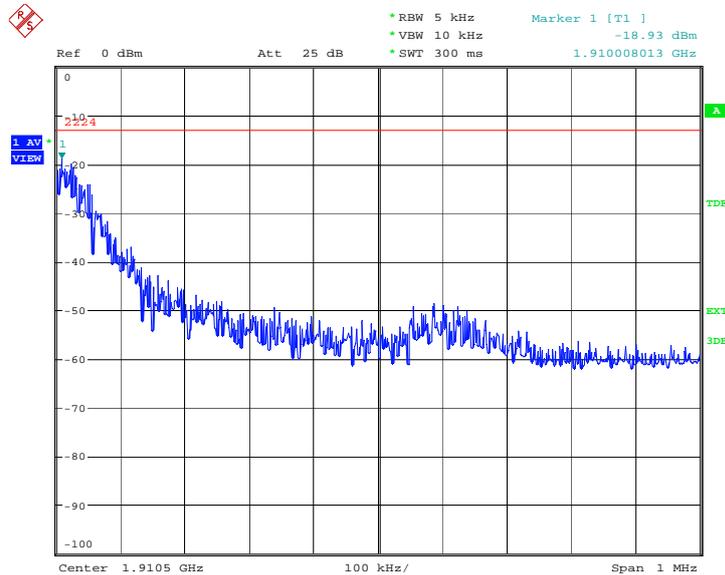
Date: 24.FEB.2012 07:11:17

GPRS 1900
LOW BAND EDGE BLOCK-A (PCS-1900)-Channel 512



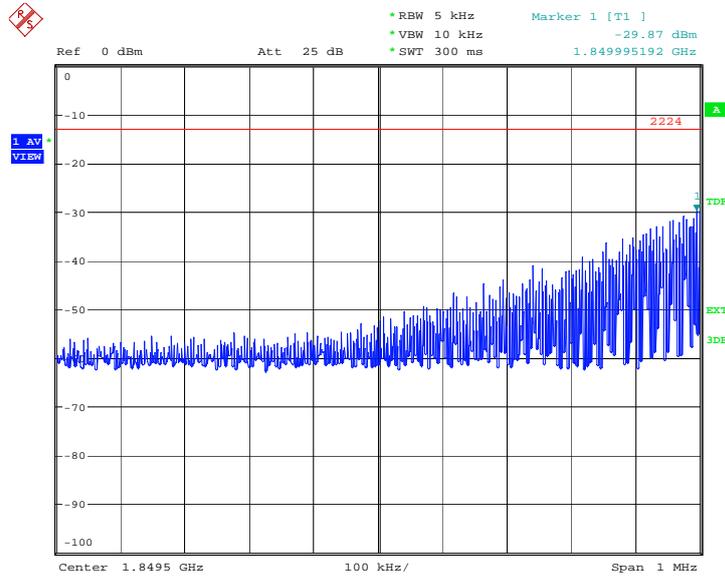
Date: 2.MAR.2012 07:08:21

HIGH BAND EDGE BLOCK-C (PCS-1900) -Channel 810



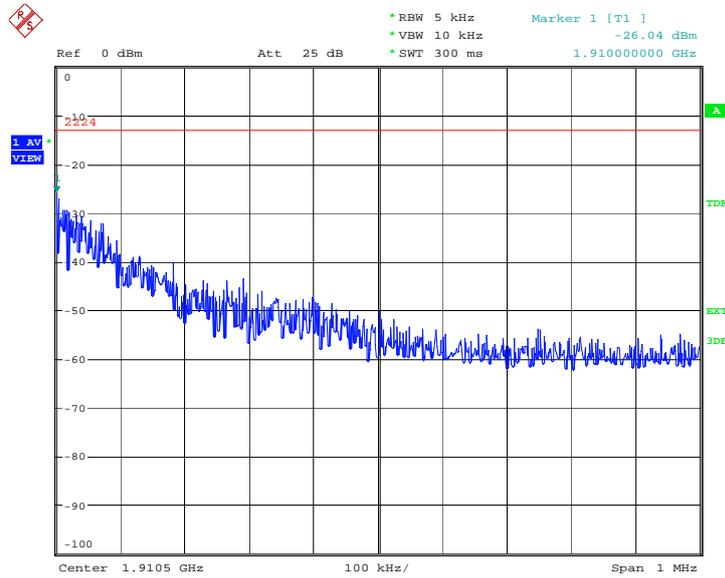
Date: 2.MAR.2012 07:08:38

EGPRS 1900
LOW BAND EDGE BLOCK-A (PCS-1900)-Channel 512



Date: 2.MAR.2012 06:54:11

HIGH BAND EDGE BLOCK-C (PCS-1900) -Channel 810



Date: 2.MAR.2012 06:54:30

A.8 CONDUCTED SPURIOUS EMISSION

Reference

FCC: CFR Part 2.1057, 22.917, 24.238

IC: RSS 132, Issue 2, Section 4.5. RSS 133, Issue 5, Section 6.5

A.8.1 Measurement Method

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data are taken from 30 MHz to 20 GHz. For GSM850, data are taken from 30 MHz to 10 GHz.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

GSM850 Transmitter

| Channel | Frequency (MHz) |
|---------|-----------------|
| 128 | 824.2 |
| 190 | 836.6 |
| 251 | 848.8 |

PCS1900 Transmitter

| Channel | Frequency (MHz) |
|---------|-----------------|
| 512 | 1850.2 |
| 661 | 1880.0 |
| 810 | 1909.8 |

A. 8.2 Measurement Limit

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A. 8.3 Measurement result

Measurement Uncertainty: 0.3dB

GSM850

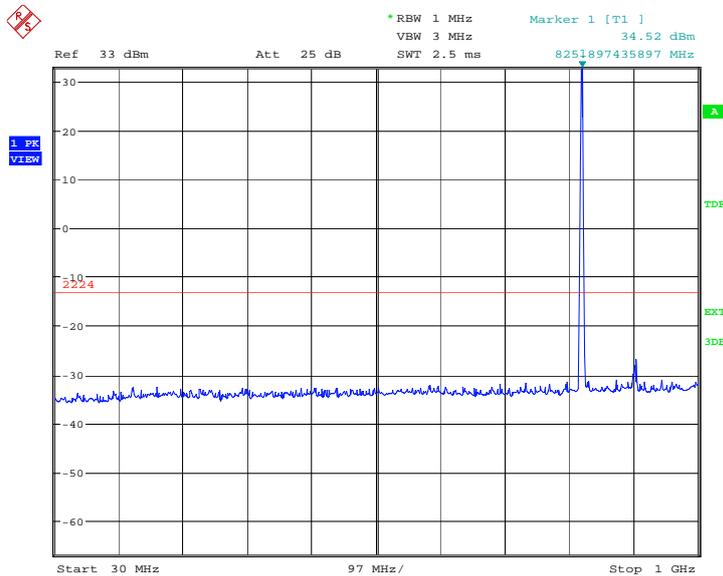
| Harmonic | Tx ch. 128 Freq. (MHz) | Level (dBm) | Tx ch. 190 Freq. (MHz) | Level (dBm) | Tx ch. Freq. (MHz) 251 | Level (dBm) |
|----------|------------------------------|----------------|------------------------------|----------------|------------------------------|----------------|
| 2 | 1648.4 | nf | 1673.2 | nf | 1697.6 | nf |
| 3 | 2472.6 | nf | 2509.8 | nf | 2546.4 | nf |
| 4 | 3296.8 | nf | 3346.4 | nf | 3395.2 | nf |
| 5 | 4121 | nf | 4183 | nf | 4244 | nf |
| 6 | 4945.2 | nf | 5019.6 | nf | 5092.8 | nf |
| 7 | 5769.4 | nf | 5856.2 | nf | 5941.6 | nf |
| 8 | 6593.6 | nf | 6692.8 | nf | 6790.4 | nf |
| 9 | 7417.8 | nf | 7529.4 | nf | 7639.2 | nf |
| 10 | 8242 | nf | 8366 | nf | 8488 | nf |

nf: Noise floor

A.8.3.1 Channel 128: 30MHz – 1GHz

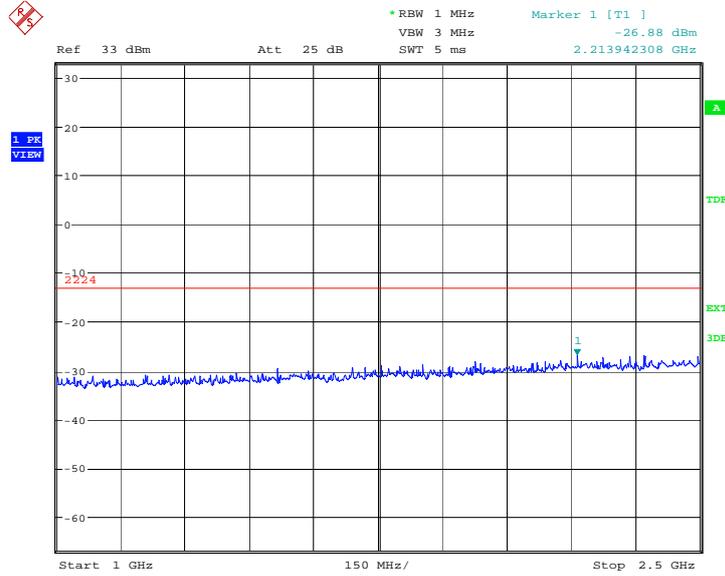
Spurious emission limit –13dBm.

NOTE: peak above the limit line is the carrier frequency.



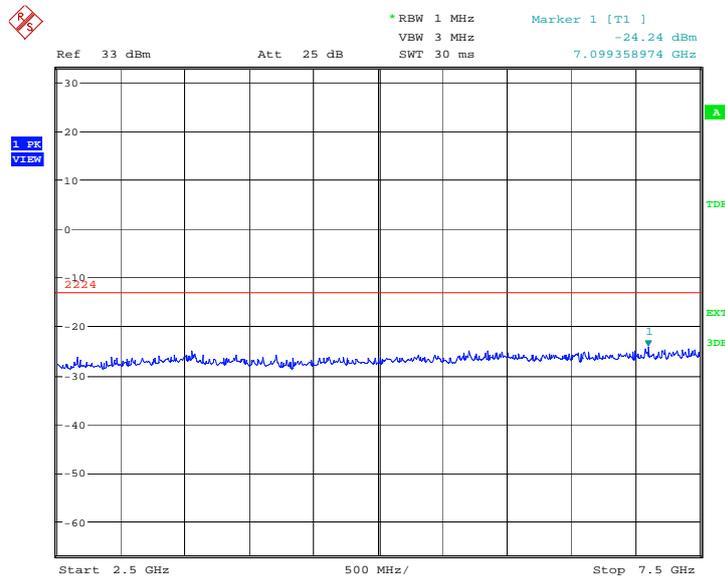
Date: 24.FEB.2012 06:55:08

A.8.3.2 Channel 128: 1GHz – 2.5GHz
Spurious emission limit –13dBm.



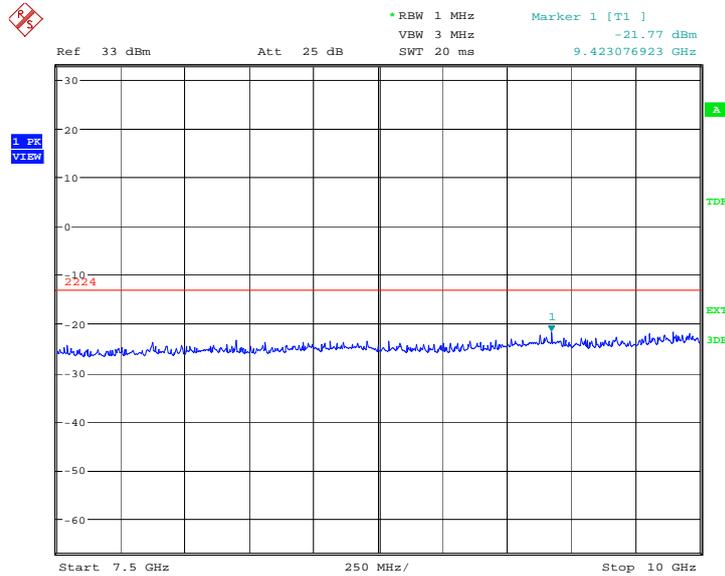
Date: 24.FEB.2012 06:55:36

A.8.3.3 Channel 128: 2.5GHz – 7.5GHz
Spurious emission limit –13dBm.



Date: 24.FEB.2012 06:56:04

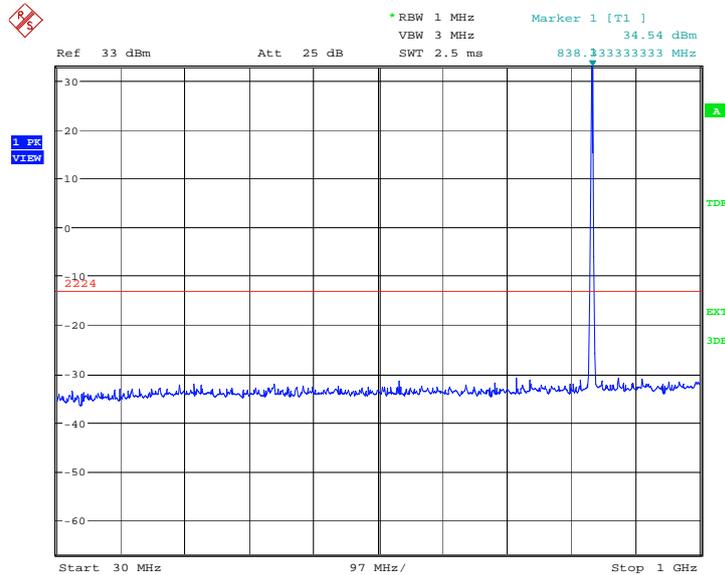
A.8.3.4 Channel 128: 7.5GHz –10GHz
Spurious emission limit –13dBm.



Date: 24.FEB.2012 06:56:33

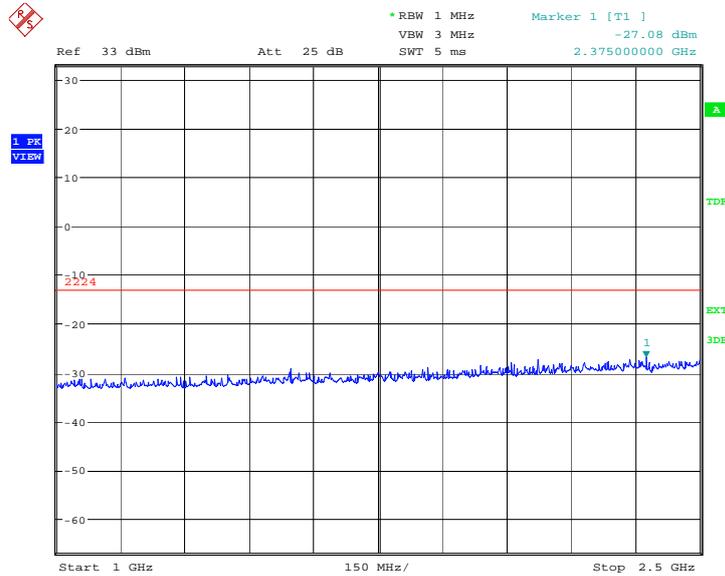
A.8.3.5 Channel 190: 30MHz – 1GHz
Spurious emission limit –13dBm

NOTE: peak above the limit line is the carrier frequency.



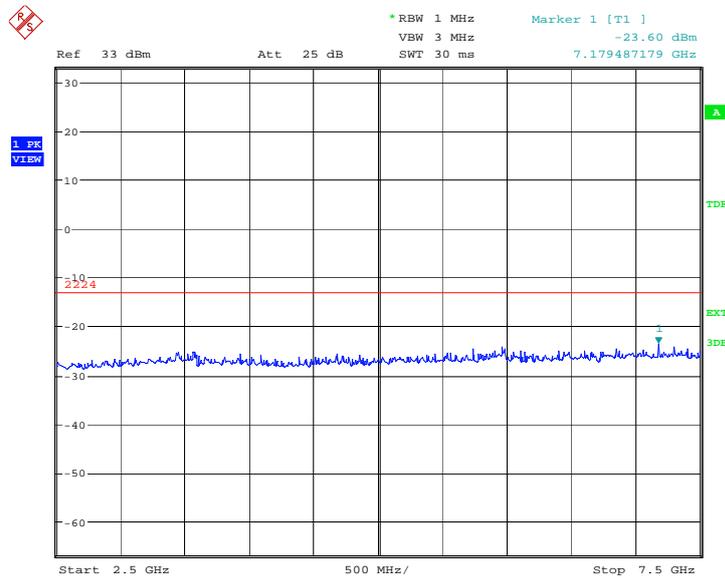
Date: 24.FEB.2012 06:57:02

A.8.3.6 Channel 190: 1GHz –2.5GHz
Spurious emission limit –13dBm



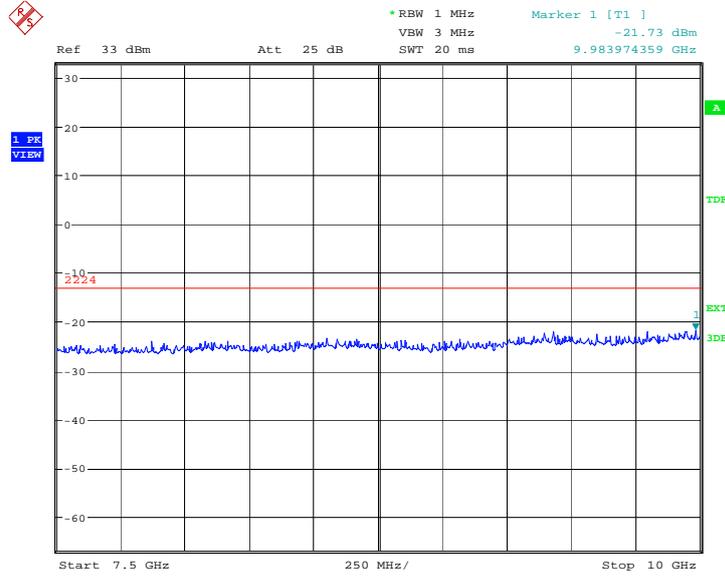
Date: 24.FEB.2012 06:57:30

A.8.3.7 Channel 190: 2.5GHz –7.5GHz
Spurious emission limit –13dBm



Date: 24.FEB.2012 06:57:59

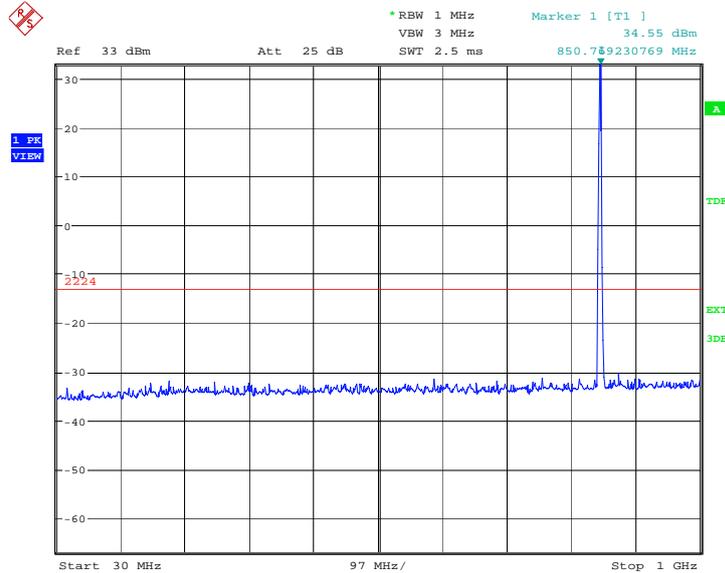
A.8.3.8 Channel 190: 7.5GHz –10GHz
Spurious emission limit –13dBm



Date: 24.FEB.2012 06:58:27

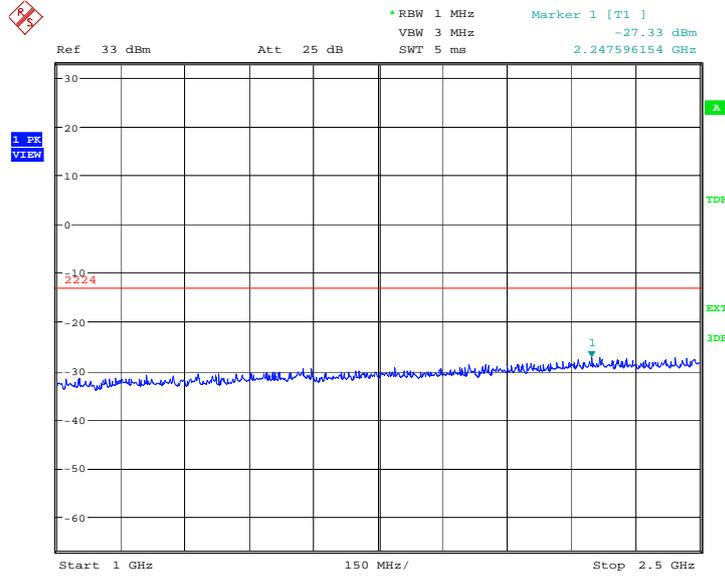
A.8.3.9 Channel 251: 30MHz – 1GHz
Spurious emission limit –13dBm.

NOTE: peak above the limit line is the carrier frequency.



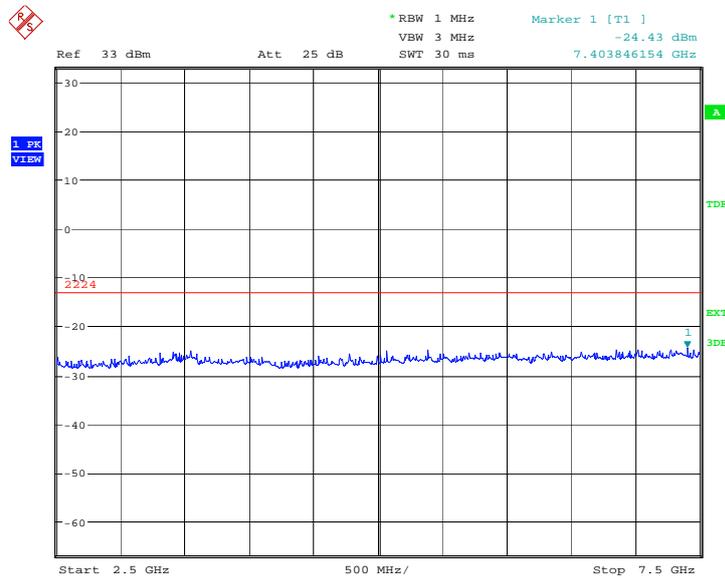
Date: 24.FEB.2012 06:58:56

A.8.3.10 Channel 251: 1GHz – 2.5GHz
Spurious emission limit –13dBm.



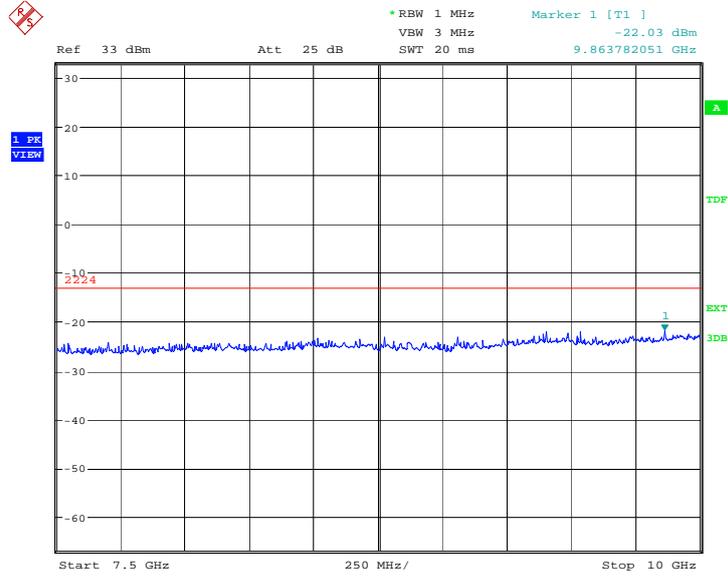
Date: 24.FEB.2012 06:59:24

A.8.3.11 Channel 251:2.5GHz – 7.5GHz
Spurious emission limit –13dBm.



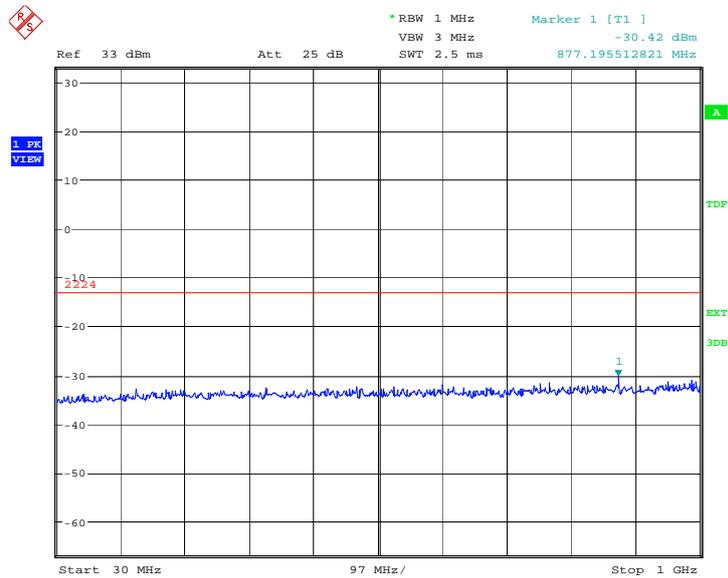
Date: 24.FEB.2012 06:59:53

A.8.3.12 Channel 251: 7.5GHz – 10GHz
Spurious emission limit –13dBm.



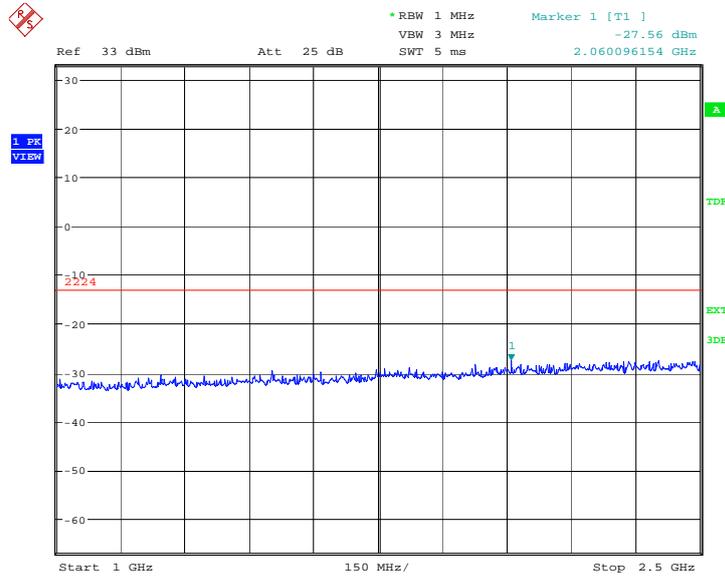
Date: 24.FEB.2012 07:00:21

A.8.3.13 Idle mode: 30MHz – 1GHz
Spurious emission limit –13dBm.



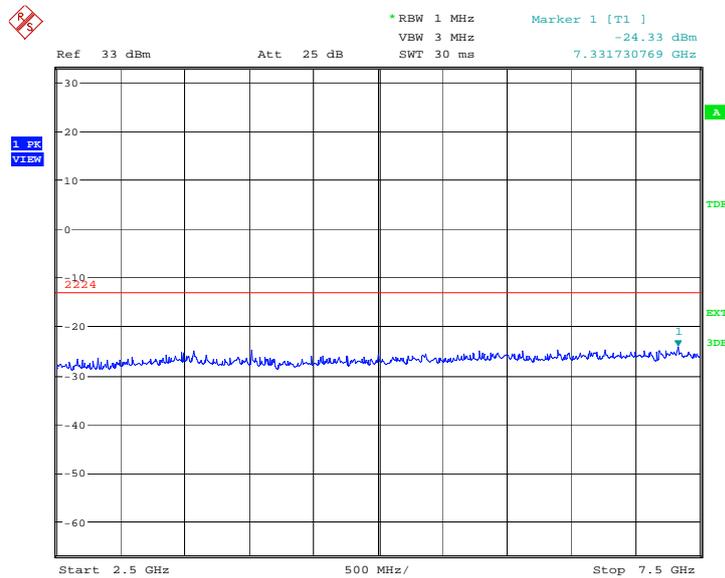
Date: 24.FEB.2012 07:00:50

A.8.3.14 Idle mode: 1GHz – 2.5GHz
Spurious emission limit –13dBm.



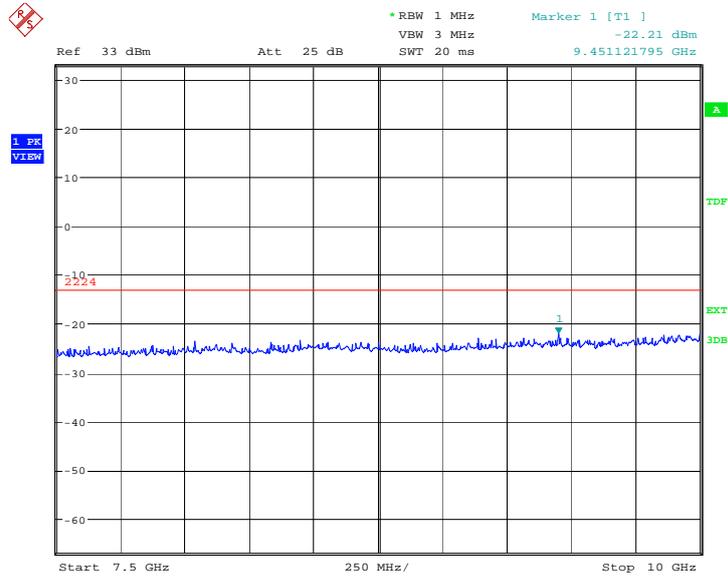
Date: 24.FEB.2012 07:01:18

A.8.3.15 Idle mode: 2.5GHz – 7.5GHz
Spurious emission limit –13dBm.



Date: 24.FEB.2012 07:01:47

A.8.3.16 Idle mode: 7.5GHz – 10GHz
Spurious emission limit –13dBm.



Date: 24.FEB.2012 07:02:15

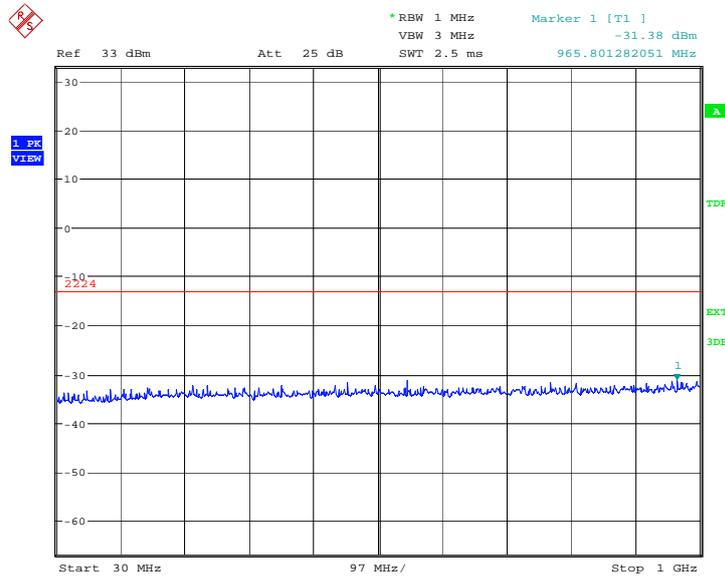
PCS1900

| Harmonic | Tx ch. 512 Freq. (MHz) | Level (dBm) | Tx ch. 661 Freq. (MHz) | Level (dBm) | Tx ch. 810 Freq. (MHz) | Level (dBm) |
|-----------------|------------------------------|----------------|------------------------------|----------------|------------------------------|----------------|
| 2 | 3700.4 | nf | 3760 | nf | 3819.6 | nf |
| 3 | 5550.6 | nf | 5640 | nf | 5729.4 | nf |
| 4 | 7400.8 | nf | 7520 | nf | 7639.2 | nf |
| 5 | 9251.0 | nf | 9400 | nf | 9549.0 | nf |
| 6 | 11101.2 | nf | 11280 | nf | 11458.8 | nf |
| 7 | 12951.4 | nf | 13160 | nf | 13368.6 | nf |
| 8 | 14801.6 | nf | 15040 | nf | 15278.4 | nf |
| 9 | 16651.8 | nf | 16920 | nf | 17188.2 | nf |
| 10 | 18502.0 | nf | 18800 | nf | 19098.0 | nf |
| nf: Noise floor | | | | | | |

PCS1900

A.8.3.17 Channel 512: 30MHz – 1GHz

Spurious emission limit –13dBm.

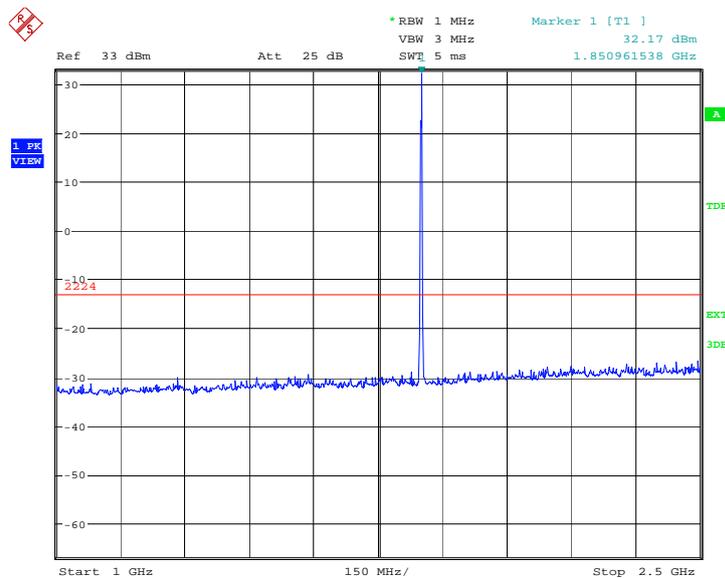


Date: 2.MAR.2012 07:34:43

A.8.3.18 Channel 512: 1GHz – 2.5GHz

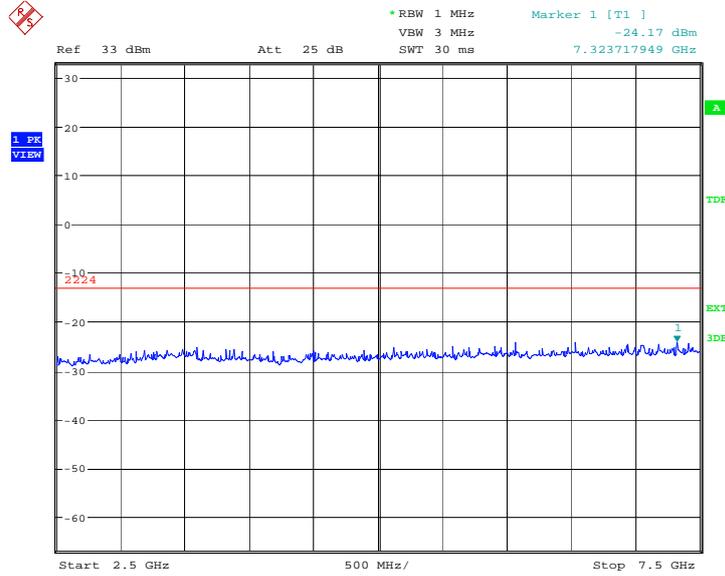
Spurious emission limit –13dBm.

NOTE: peak above the limit line is the carrier frequency.



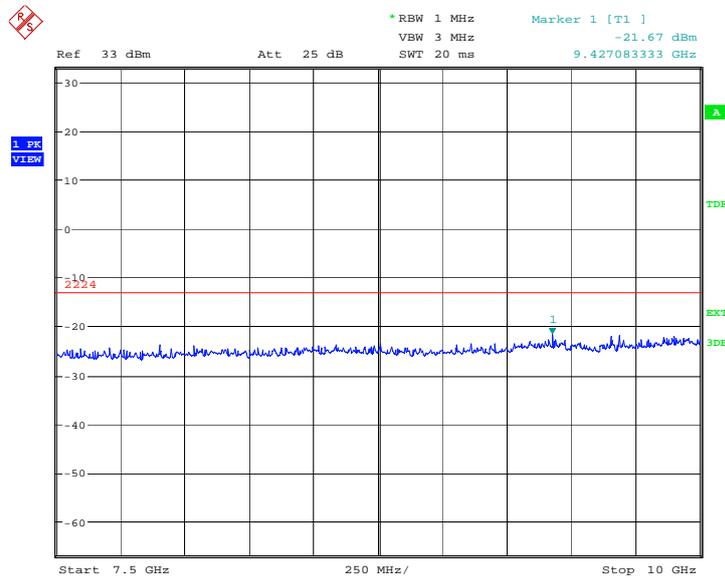
Date: 2.MAR.2012 07:35:11

A.8.3.19 Channel 512: 2.5GHz – 7.5GHz
Spurious emission limit –13dBm.



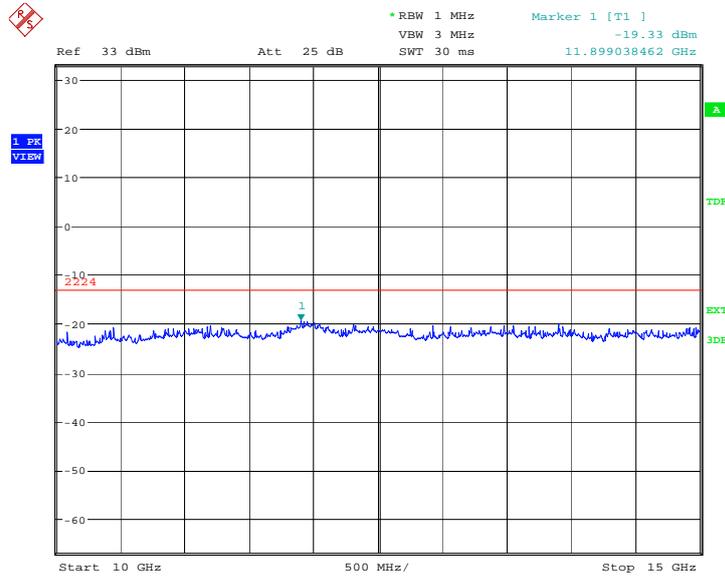
Date: 2.MAR.2012 07:35:40

A.8.3.20 Channel 512: 7.5GHz –10GHz
Spurious emission limit –13dBm.



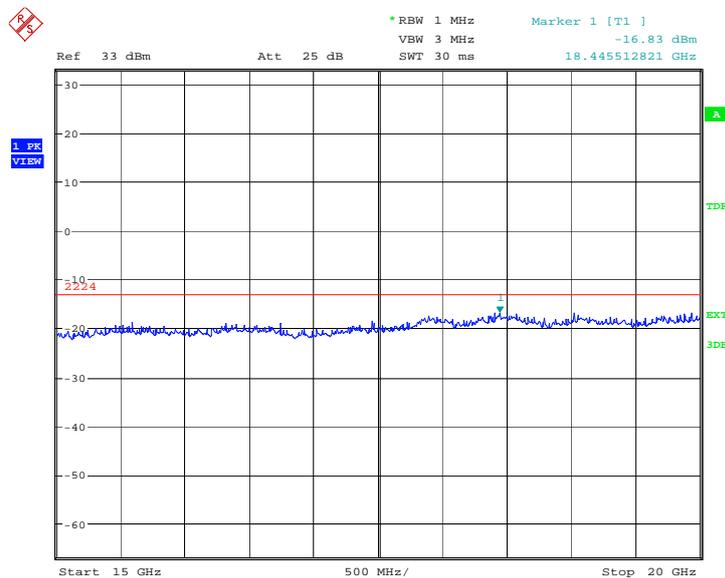
Date: 2.MAR.2012 07:36:08

A.8.3.21 Channel 512: 10GHz –15GHz
Spurious emission limit –13dBm.



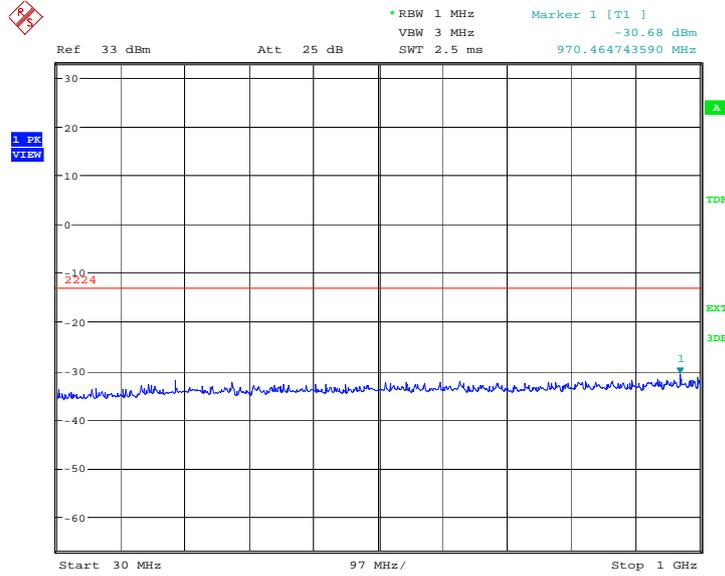
Date: 2.MAR.2012 07:36:36

A.8.3.22 Channel 512: 15GHz –20GHz
Spurious emission limit –13dBm.



Date: 2.MAR.2012 07:37:04

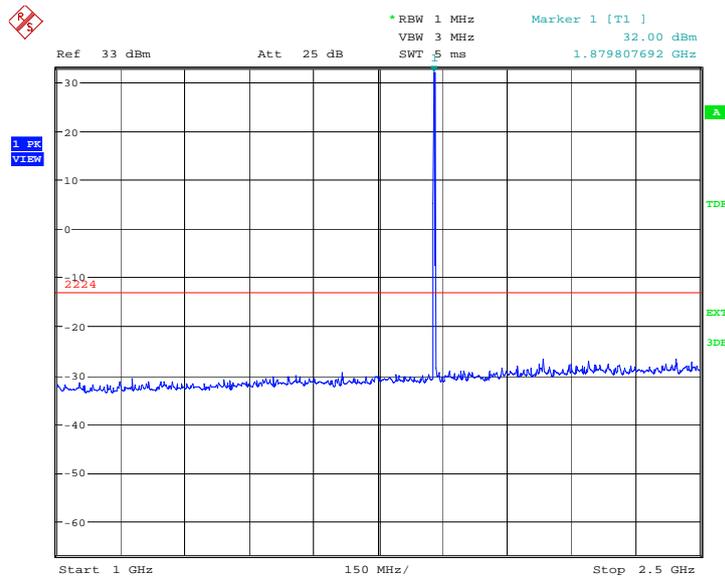
A.8.3.23 Channel 661: 30MHz – 1GHz
Spurious emission limit –13dBm



Date: 2.MAR.2012 07:37:33

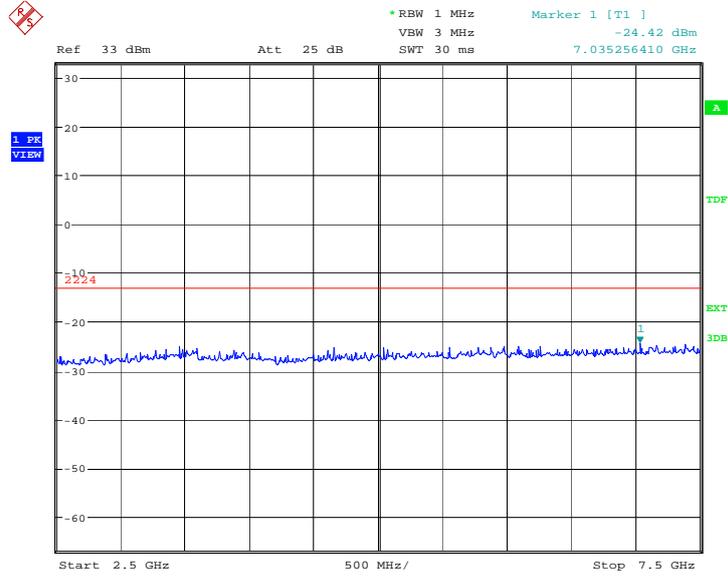
A.8.3.24 Channel 661: 1GHz –2.5GHz
Spurious emission limit –13dBm

NOTE: peak above the limit line is the carrier frequency.



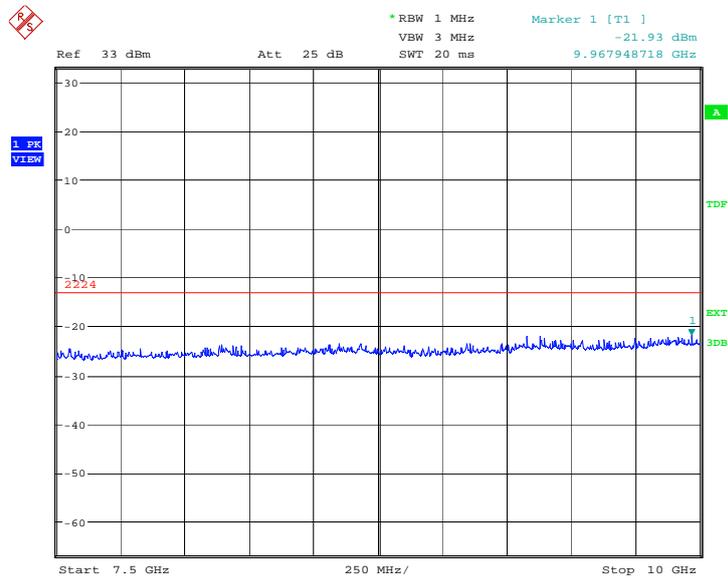
Date: 2.MAR.2012 07:38:01

A.8.3.25 Channel 661: 2.5GHz –7.5GHz
Spurious emission limit –13dBm



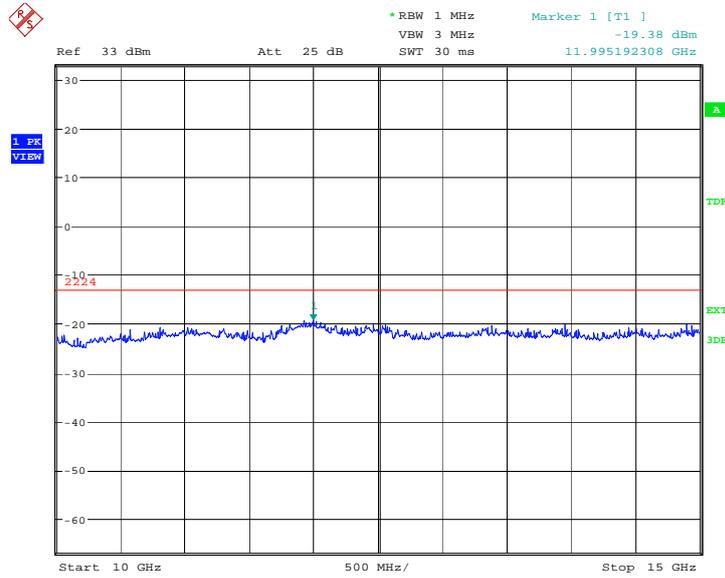
Date: 2.MAR.2012 07:38:30

A.8.3.26 Channel 661: 7.5GHz –10GHz
Spurious emission limit –13dBm



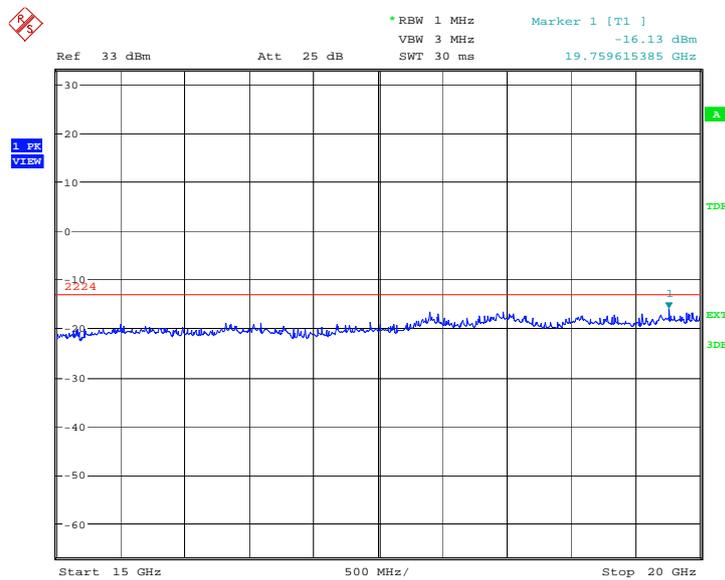
Date: 2.MAR.2012 07:38:58

A.8.3.27 Channel 661: 10GHz –15GHz
Spurious emission limit –13dBm.



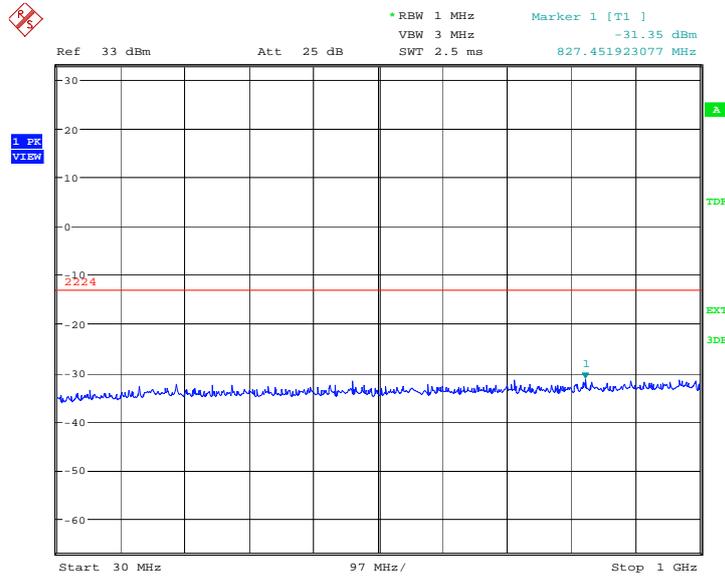
Date: 2.MAR.2012 07:39:26

A.8.3.28 Channel 661: 15GHz –20GHz
Spurious emission limit –13dBm.



Date: 2.MAR.2012 07:39:54

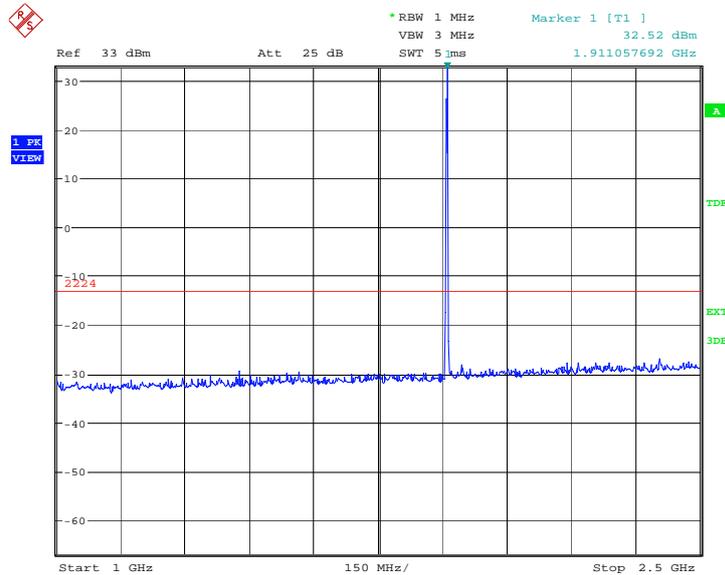
A.8.3.29 Channel 810: 30MHz – 1GHz
Spurious emission limit –13dBm.



Date: 2.MAR.2012 07:40:23

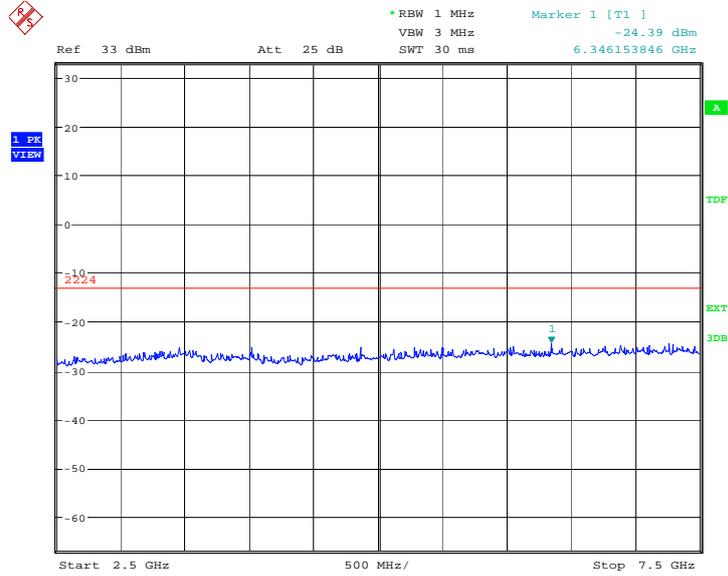
A.8.3.30 Channel 810: 1GHz – 2.5GHz
Spurious emission limit –13dBm.

NOTE: peak above the limit line is the carrier frequency.



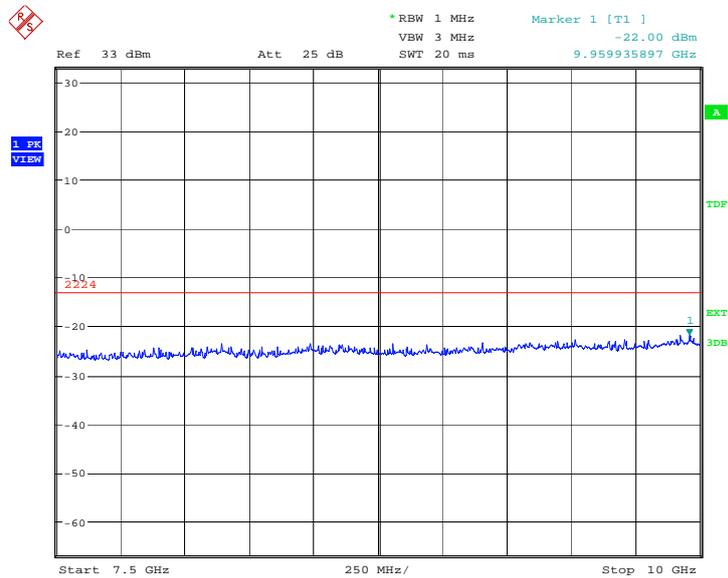
Date: 2.MAR.2012 07:40:52

A.8.3.31 Channel 810:2.5GHz – 7.5GHz
Spurious emission limit –13dBm.



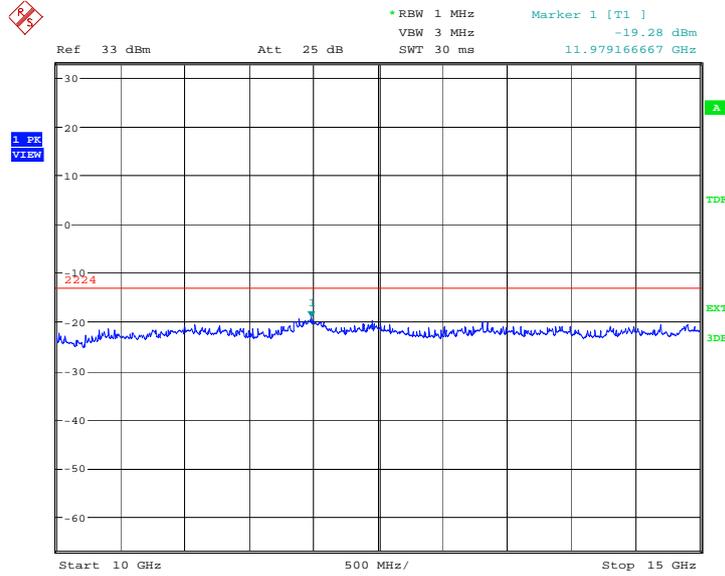
Date: 2.MAR.2012 07:41:20

A.8.3.32 Channel 810: 7.5GHz – 10GHz
Spurious emission limit –13dBm.



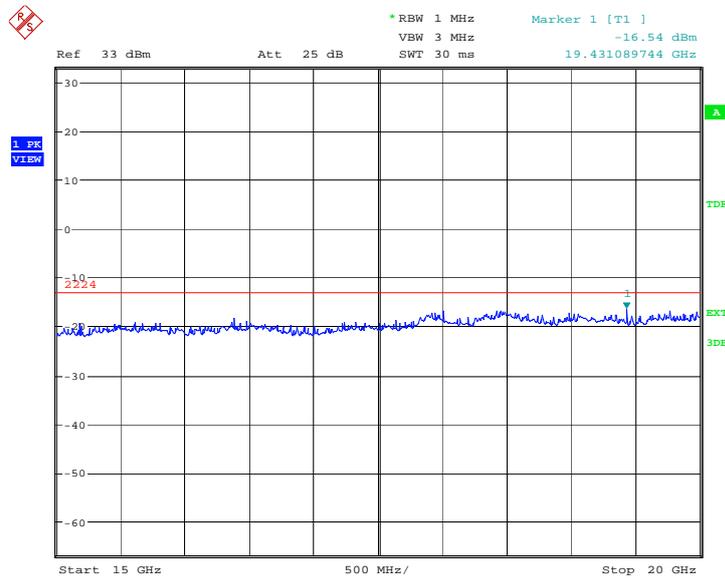
Date: 2.MAR.2012 07:41:48

A.8.3.33 Channel 810: 10GHz –15GHz
Spurious emission limit –13dBm.



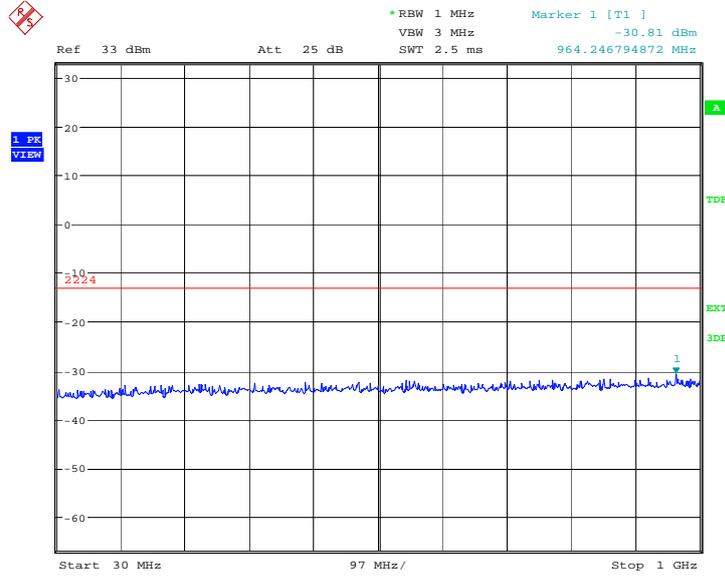
Date: 2.MAR.2012 07:42:16

A.8.3.34 Channel 810: 15GHz –20GHz
Spurious emission limit –13dBm.



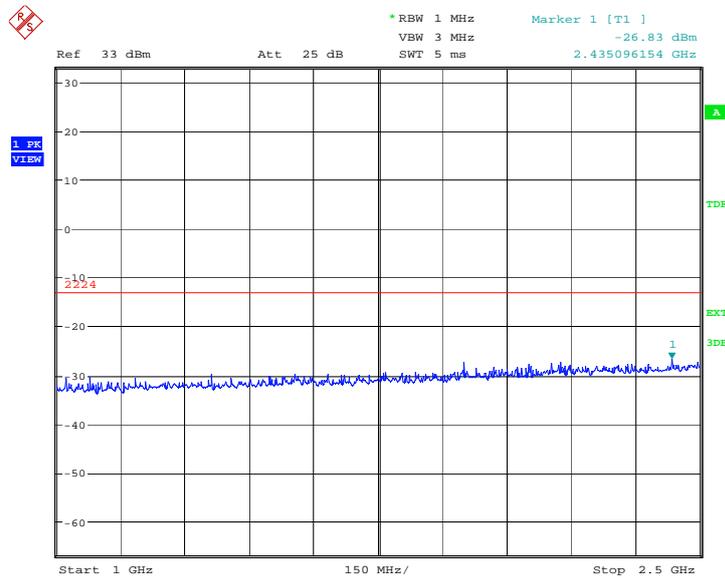
Date: 2.MAR.2012 07:42:45

A.8.3.35 Idle mode: 30MHz – 1GHz
Spurious emission limit –13dBm.



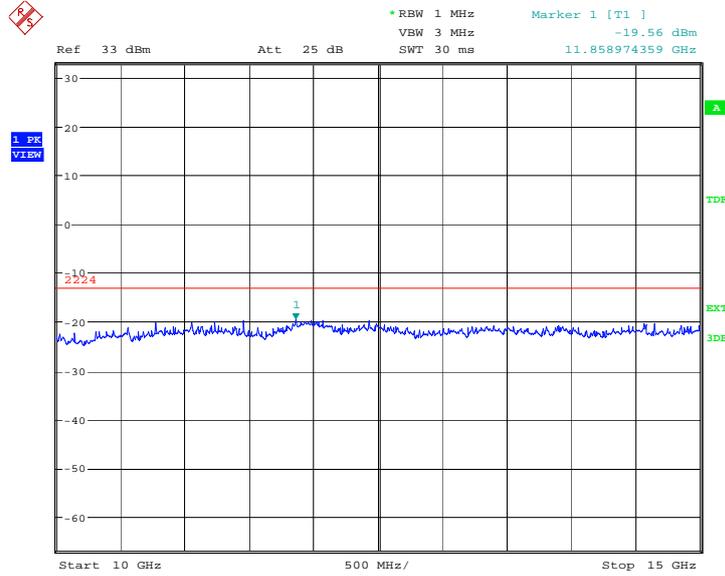
Date: 24.FEB.2012 07:20:14

A.8.3.36 Idle mode: 1GHz – 2.5GHz
Spurious emission limit –13dBm.



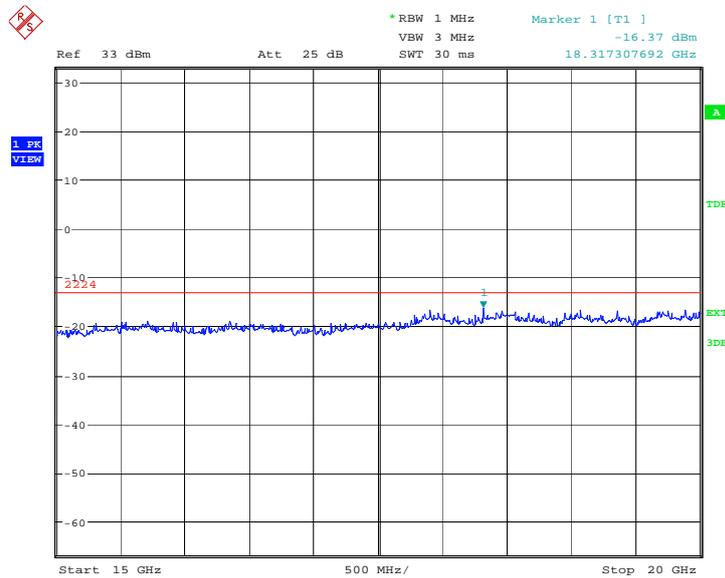
Date: 24.FEB.2012 07:20:42

A.8.3.39 Idle mode: 10GHz –15GHz
Spurious emission limit –13dBm.



Date: 24.FEB.2012 07:22:07

A.8.3.40 IDLE mode: 15GHz –20GHz
Spurious emission limit –13dBm.



Date: 24.FEB.2012 07:22:35

A.9 RECEIVER RADIATION EMISSION

Reference

FCC: CFR Part 2.1053, 15.109

IC: RSS 132, Issue 2, Section 4.6. RSS 133, Issue 5, Section 6.6

A.9.1 Method of Measurement

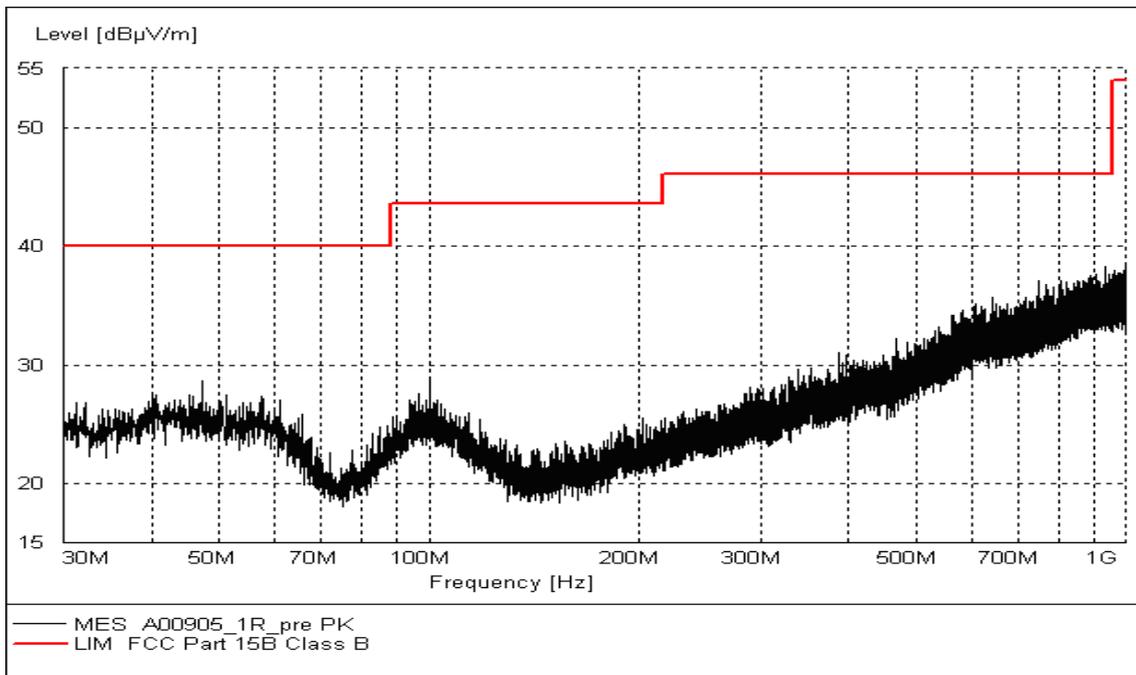
The measurement procedure in ANSI C64.4-2003 is used. The EUT is placed on a 80cm height non-conductive table locating on the center of turntable. From 30MHz-1GHz, the measurement distance is 10m. For frequency range above 1GHz, the measurement distance is 3m.

The EUT is measured with travel charger and the operating mode is idle without CMU200's signaling.

A.9.2 Method of Measurement

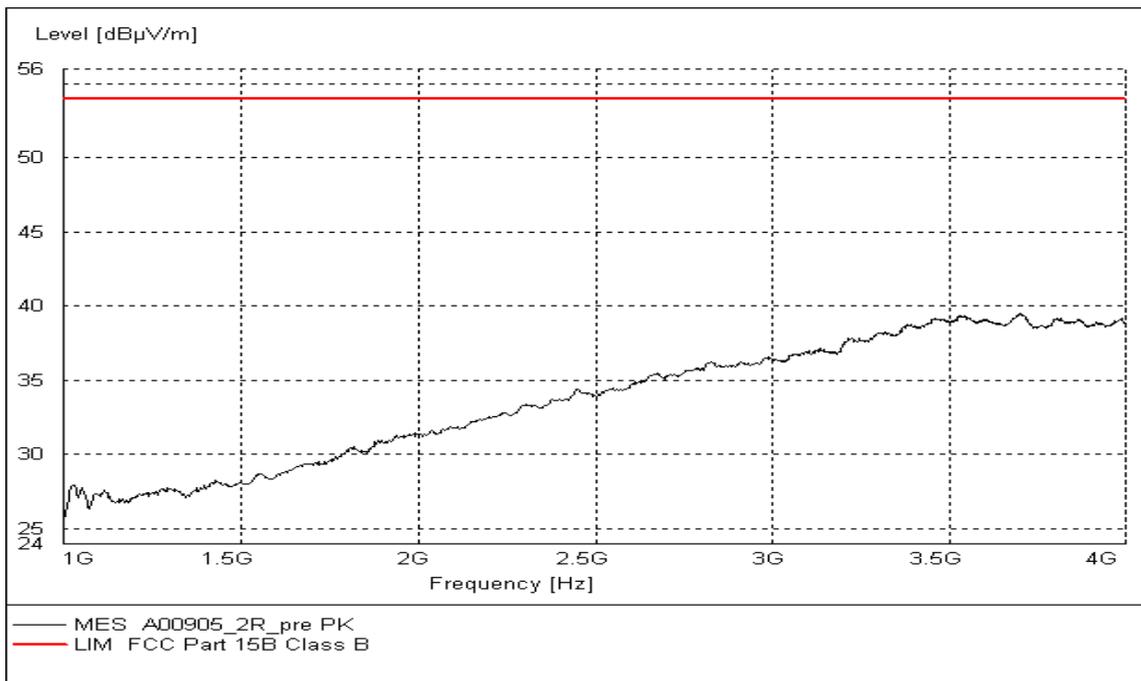
| Frequency of Emission (MHz) | Limit (dB μ V/m) | Measurement Distance (m) |
|-----------------------------|----------------------|--------------------------|
| 30-88 | 40 | 3 |
| 88-216 | 43.5 | 3 |
| 216-960 | 46 | 3 |
| 960-1000 | 54 | 3 |
| >1000 | 54 | 3 |

A. 9.3 Measurement results



IF bandwidth: 120 kHz

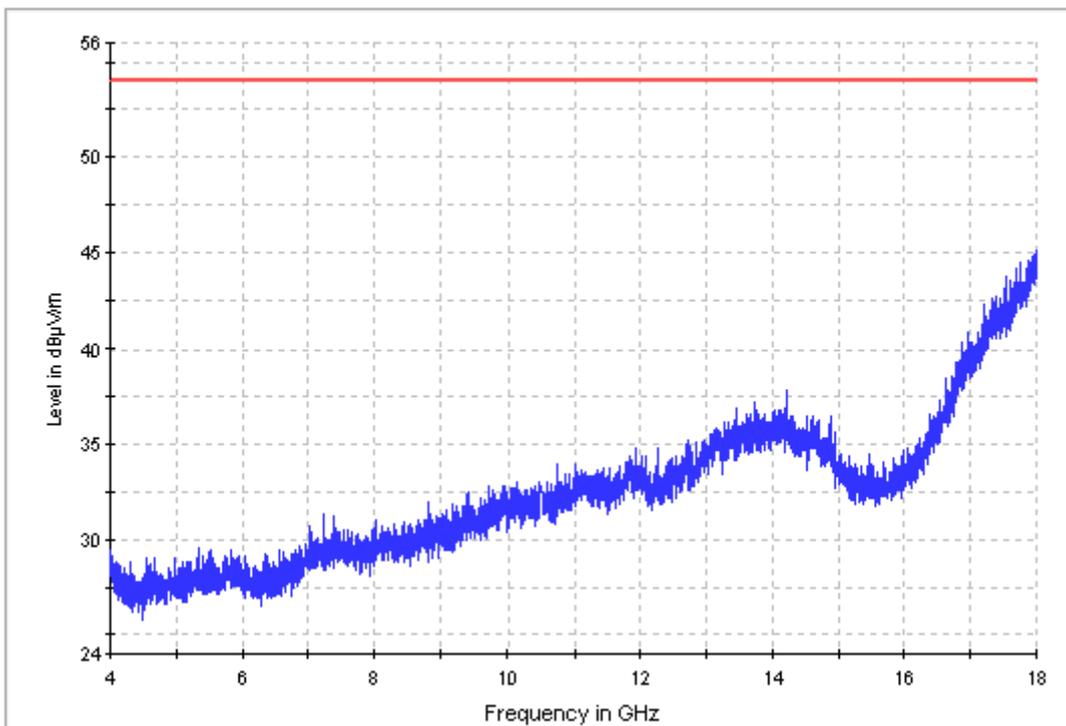
Idle Mode: 30MHz-1GHz



RBW / VBW 1 MHz

Idle Mode: 1GHz-4GHz

FCC 4-18G



RBW / VBW 1 MHz

Idle Mode: 4GHz-18GHz